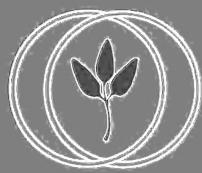


Australasian Plant Conservation

Bulletin of the Australian Network for Plant Conservation Inc



Volume 31 Number 3 December 2022 – February 2023



ANPC INC. MISSION STATEMENT: To promote and improve plant conservation

ANPC National Office

GPO Box 1777
Canberra, ACT 2601, Australia
T (02) 6250 9509
E anpc@anpc.asn.au
W www.anpc.asn.au

ANPC Staff

Chantelle Doyle, Christine Fernance,
Jo Lynch, Amelia Martyn-Yenson

ANPC Volunteers

Robert Hawes

ANPC Committee

President Tony Auld
Vice President David Coates
Treasurer Grant Warner
Secretary Robert Hawes

Committee Members

Linda Broadhurst, Andrew Crawford,
Andrew Fairney, Singarayer Florentine,
Kelli Gowland, Lydia Guja,
Bob Makinson, Melissa Millar,
Leonie Monks, Cathy Offord,
Damian Wrigley

ANPC News

Go to www.anpc.asn.au/anpc-news/
to read the latest newsletters
and subscribe.

New Zealand Plant Conservation Network

President Sarah Beadel
Secretary Rewi Elliot
PO Box 2199, Wellington, New Zealand
E info@nzpcn.org.nz
W www.nzpcn.org.nz

Australasian Plant Conservation

Editor

Nathan Emery

Associate Editors

Christine Fernance and Heidi Zimmer

Editorial Team

Lydia Guja, Jo Lynch, Amelia Martyn-Yenson,
Melissa Millar and Leonie Monks

Layout & Graphic Design

Siobhan Duffy

Australasian Plant Conservation is produced
by the ANPC Inc. with assistance from the
Australian National Botanic Gardens.

Australasian Plant Conservation is printed
on recycled paper.

ISSN 1039-6500

Copyright

Opinions expressed in this publication are those
of the authors and are not necessarily those of
the ANPC or its sponsors. Material presented in
Australasian Plant Conservation may be copied
for personal use or published for educational
purposes, provided that any extracts are fully
acknowledged. Where any material is credited to
and/or copyright to another source, please contact
the original source for permission to reprint.

Contributing to *Australasian Plant Conservation*

Australasian Plant Conservation is a forum for
information exchange for all those involved in
plant conservation: please use it to share your
work with others. Articles, information snippets,
details of new publications or research and
diary dates are welcome. General articles on
any plant conservation issue are most welcome.

The deadline for the autumn 2023 issue is
17 February 2023. If you are intending to
submit an article or wish to discuss possibilities,
please email the editor, Nathan Emery:
editor@anpc.asn.au.

Authors are encouraged to submit images with
articles or information. Please submit images
in electronic format, resolution needs to be at
least 300 dpi, at least the size that they are to
be published, in tif, jpg or gif format. Guidelines
for authors and an article template are at:
<http://www.anpc.asn.au/apc>.

Using the article template, please send articles,
no more than 1200 words, as an MS Word file by
email to: editor@anpc.asn.au.

ANPC Major Partners

GOLD PARTNERS



Australian National
Botanic Gardens



Australian Government



San Diego Zoo
Wildlife Alliance

OTHER PARTNERS AND SUPPORTERS



UNSW
SYDNEY



NSW
GOVERNMENT

Front cover: *Grevillea gariwerdensis*
(Gariwerd Grevillea). Photo: Russell Larke.

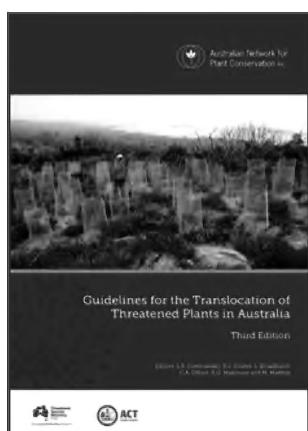
Printed by: Trendsetting, Canberra.

This issue

From the editor by Nathan Emery	2
Australian Network for Plant Conservation Inc. President's Report by Dr Tony Auld	3
Assessing the impacts of drought on <i>Micromyrtus grandis</i> by Adam Fawcett	19
New records of endangered desert cow-vine <i>Ipomoea diamantinensis</i> after summer flood on the Narran River, New South Wales by Darren Shelly	22
Case study: Threatened plant translocation – <i>Leichhardtia coronata</i> (Slender milkvine), Apocynaceae by Peter Moonie, Jennifer Coleman, Justin Sanderson and Carly Sugars	25
Designing biodiversity field guides in the Central Tablelands by Thomas Lee, Chris Gaul and Corey Tatz	29

Regular features

News from the ASBP.....	31
ANPC Member Profile	36
Book review.....	38
ANPC news and conferences	39
ANPC Corporate Members	45



Guidelines for the Translocation of Threatened Plants in Australia – 3rd Edition

Step-by-step information on how to do best-practice translocations, improve translocation success and contribute to preventing plant extinctions.

3rd Edition 2018 | Eds L.E. Commander, D.J. Coates, L. Broadhurst, C.A. Offord, R.O. Makinson and M. Matthes. Australian Network for Plant Conservation, Canberra.

For more information and to order a hard copy or download a free PDF copy, go to www.anpc.asn.au/translocation

From the editor

NATHAN EMERY

A very warm welcome to the summer issue of Australasian Plant Conservation, and my first issue as Editor of APC. My predecessor, Heidi Zimmer has done a tremendous job as Editor over the last several years and I am sure I speak for all of the editorial team, authors, volunteers and everyone who has contributed to APC over the past four years by saying thank you Heidi for your superb efforts ensuring APC continues to be a successful and accessible publication. I hope to continue this great work.

Four articles are included in this issue, covering a diverse range of plant conservation topics. This issue begins with the ANPC President's Report which covers a very busy and successful 2022 for ANPC. Our first article by Fawcett provides an assessment of the Endangered *Micromyrtus grandis* populations following the significant drought last decade. Fawcett highlights the importance of population monitoring as he reports population losses following the drought despite the species being noted as drought-tolerant. We move from drought to flood with the next article by Shelley who shares some positive news of new records of the Endangered *Ipomoea diamantinensis* following summer floods.

Following extensive surveys, Shelley reports an abundance of the species at record levels along the Narran River in New South Wales. We then shift gears to a threatened plant translocation case study of the Vulnerable *Leichhardtia coronata* by Moonie *et al.* For this translocation, more than 1,500 plants were translocated with a survival rate of around 45% approximately 18-months post-planting. The authors cite possible reasons for this result as well as other key findings from this study. The final article for this issue by Lee *et al.* covers the design considerations of biodiversity field guides, with a particular focus on ways to present knowledge and conservation to different audiences.

Capping off this issue are the regular features. For the Australian Seedbank Partnership News, Ohlsen and Miller provide an overview of the new spore bank to store fern and lycophyte species from Victoria. This is followed by a member profile, book review and ANPC News.

The image shows a black and white photograph of a leafy branch in the background. In the foreground, there is a graphic element on the left featuring the 'PROJECT PHOENIX' logo, which consists of a stylized flame or swirl icon above the word 'PROJECT PHOENIX' in a curved font. To the right, a white rectangular box contains the title 'A STRATEGY FOR THE AUSTRALIAN NATIVE SEED SECTOR' in bold capital letters, with the date 'NOVEMBER 2021' at the bottom. The box is set against a dark, textured background.

THE STRATEGY FOR THE
AUSTRALIAN NATIVE SEED
SECTOR IS NOW LIVE.

greeningaustralia.org.au/projectphoenix-implementing-the-ten-year-strategy/

Australian Network for Plant Conservation Inc. President's Report

To the Annual General meeting, 16 November 2022

DR TONY AULD

President, Australian Network for Plant Conservation Inc.

I am very proud to say that 2022, our 31st year, has once again been a very successful year for the ANPC and our role as Australia's key plant conservation organisation.

In early 2022, COVID-19 continued to restrict our ability to hold face-to-face events. However, like many organisations, we have adapted well to the online space. In their place, we have held virtual webinars, symposia and training workshops, and successfully organised and ran the 13th Australasian Plant Conservation Conference as our first hybrid event in April.

The ANPC has continued to receive significant project and grant funding this year to keep us extremely active in the plant conservation sphere, as well as financially viable. We have extensively collaborated with partners across the country to:

- Provide safe custody for Native Guava (*Rhodomyrtus psidiooides*) which is at risk of extinction due to Myrtle Rust.
- Prevent rare plant extinction and reduce impacts of future fires, continuing our field surveys and assessments of species of national significance potentially adversely impacted by the 2019/2020 fires.
- Provide education on Victorian threatened plant translocations through a free two-day online symposium.
- Produce the Plants Going Places video and podcast series to share stories of plant translocations in Victoria.
- Promote the third edition of ANPC's 'Plant Germplasm Conservation in Australia' guidelines and complete a survey to understand how the Guidelines are being used.
- Coordinate a four-part webinar series on the Germplasm Guidelines hosted in collaboration with the BGANZ Collections and Records Management Group.
- Hold the second day of the Australian Academy of Science Fenner Conference on the Environment 'Exceptional times, exceptional plants' as a hybrid event.
- Produce nine videos on various aspects of the Germplasm Guidelines.
- Promulgate and share the endorsed Healthy Seeds Roadmap.



ANPC President Dr Tony Auld addressing the 13th Australasian Plant Conservation Conference in Albury. Photo: Chris Fernance

Projects

Safe Custody for Native Guava

<https://www.anpc.asn.au/safe-custody-for-native-guava/>

The ANPC commenced leading a new and exciting project in May this year, a collaboration between botanic gardens and government agencies in QLD, NSW, the ACT and Victoria to deliver conservation actions for the Native Guava (*Rhodomyrtus psidiooides*) using a pilot dispersed-custody model (metacollection). This species is listed as Critically Endangered under federal, New South Wales and Queensland legislation. Native Guava was common and in good health before Myrtle Rust was introduced to Australia in 2010 but has suffered significant declines as a result of this pathogen. *Ex situ* (offsite) conservation is needed to ensure this species will survive while long-term recovery options are pursued.

This project is providing a coordinated national response to the conservation of this species across its range through the following activities:

1. Boosting *ex situ* conservation through collection of Native Guava germplasm from NSW and Queensland. Genetic analysis of this new material will allow us to better understand population dynamics in the wild.
2. Providing resources for maintaining potted Native Guava collections in Queensland and NSW.
3. Engaging with researchers and promoting partnerships to provide Native Guava plants for further research. This can include tissue culture trials, susceptibility assays, RNAi vaccine trials, genetic research and investigating host/pathogen interactions.
4. Supporting the creation of an in-ground living collection of Native Guava at several locations across NSW, Victoria, Queensland and the ACT. This dispersed living collection of 60 individual plants will contain genetic lineages from the NSW germplasm collection.
5. Raising awareness of Myrtle Rust and promoting the project by creating a short video.



Recent cutting propagation of Native Guava *Rhodomyrtus psidioides* at Mt Annan, August 2022.
Photo: Amelia Martyn Yenson

We'd like to thank our partners for their generous support and commitment to this project:

- NSW Department of Planning and Environment (DPE).
- Queensland Departments of Environment and Science and Agriculture and Fisheries.
- Australian Botanic Garden Mount Annan (ABGMA – Science Education & Conservation Division and the Horticulture Management Division).
- Blue Mountains Botanic Garden Mount Tomah.
- Australian National Botanic Gardens.
- Dandenong Ranges Botanic Garden.
- Lismore Rainforest Botanic Gardens.
- Research Centre for Ecosystem Resilience, Royal Botanic Garden Sydney.

This project is supported
by funding from the
Australian Government.



Australian Government

Post-fire funding from San Diego Zoo Wildlife Alliance

<https://www.anpc.asn.au/prevent-rare-plant-extinction-and-reduce-impacts-of-future-fires/>

This four-year project aims to prevent rare plant extinction and reduce impacts of future fires in eastern Australia. Our progress to date:

1. Funding has supported (in combination with other funding sources) the assessment and preparation of 'Fire regimes that cause biodiversity decline' as a Key Threatening Process (KTP) under the national Environment Protection and Biodiversity Conservation Act (EPBC Act) which was formally listed in April 2022 <https://www.dccew.gov.au/environment/biodiversity/threatened/key-threatening-processes/fire-regimes-that-cause-declines-in-biodiversity>. Funding also helped develop guidance on recovery actions to build the resilience of biota to future fires, through lead authorship of a major technical report, and contributed to three journal articles (see Appendix 1). These articles are aimed at building the human contribution to the resilience of biota to future fires by quantifying the mechanisms of risk and investigating new approaches to reduce the incidence of future fires.
2. Species of national significance that were potentially adversely impacted by the 2019/2020 fires were identified, with a focus on those not currently recognised as threatened and with restricted geographic ranges. A priority list of species for field inspections was developed to identify factors threatening their recovery after fire. Unfortunately, the field surveys suffered from significant delays due to COVID-19 lockdowns and travel restrictions, and more recently from road and track closures due to heavy rainfalls and flooding in eastern Australia. Two groups of taxa were chosen (which were



Understorey dynamics in Jarrah forest exemplify the drivers of fire risk measured in Zylstra *et al.* (2022). Recently burned Jarrah (a) has a dense understorey of germinated shrubs and saplings that burned seven times more frequently than the same forest left unburnt for around 50 years, which develops an open understorey. (b) Processes of growth and forest succession such as self-thinning and self-pruning act as 'ecological controls' on wildfire spread and severity (Zylstra *et al.* 2022a). Photos: Philip Zylstra

not targeted by other similar efforts such as state and federal government initiatives):

i. Species which allowed comparisons of those with canopy versus soil seed banks and between resprouting versus obligate seeding plants. The focus was on NSW endemics, as NSW was the part of Australia most impacted by the 2019/2020 fires, and to easily collaborate with NSW Department of Planning and Environment (DPE) and universities. Standardised field data sheets were developed. The ANPC is also working with University of New South Wales (UNSW) to undertake IUCN Red List assessments and Conservation Assessments for some of these species.

Banksia paludosa subsp. *astrolux* is one of the target species being surveyed by the ANPC following the 2019/2020 bushfires. A Conservation Assessment report has been prepared and shows decline in some sites due to very low post-fire recruitment levels. Photo: Tony Auld



ii. Epiphytic orchids in north-eastern NSW. A group of eleven of these orchids, which occur on rocks and/or trees, have been chosen to examine the risk of fire severity on their survival. The 2019/20 fires are thought to have hit many of these species particularly hard because they are killed by intense fire due to a lack of both an underground dormant phase and a persistent seed bank from which to recover. These surveys commenced in September 2022 and will document the impact of the fires, establish the geographic distribution and population size of the remaining populations, and inform conservation assessment and threatened species listing. The focus so far has been on *Plectorrhiza purpurata*, *Sarcochilus aequalis* and *Tropilis angusta* (syn. *Dendrobium angustum*). A recently found population of *Plectorrhiza purpurata* was found to be heavily impacted, with most host plants dead and all epiphytes on those plants killed.



Epiphytic orchid *Plectorrhiza purpurata* growing in Cottan-Bimbang National Park. Photo: Lachlan Copeland

3. This project has supported the development and release of a video on Myrtle Rust (including in the post-fire environment) in conjunction with the Queensland and NSW governments, and indigenous stakeholders in south-east Queensland and on the NSW North Coast. The video was released on 2 November 2022 <https://www.anpc.asn.au/myrtle-rust/>. We are also planning to undertake more post-fire surveys of the impacts of Myrtle Rust on Myrtaceae species, to follow up on our 'Fire and Rust' project from last year (<https://www.anpc.asn.au/fire-and-rust/>).



Plants Going Places

<https://www.anpc.asn.au/plants-going-places/>

The ANPC completed a two-year Biodiversity Conservation grant from the Ross Trust in July 2022. The "Plants Going Places" project aimed to educate and inform both environmental scientists and practitioners on the translocation of threatened plants, for the benefit of Victoria's threatened plant species. Three videos were produced, with accompanying podcasts which explored the stories of past and current translocation projects in the Melbourne region. This series provides an insight through the eyes of practitioners to investigate what makes a translocation successful. Thanks to our producer Chantelle Doyle and videographer Michael Lawrence-Taylor for making these ground-breaking videos.

This project also supported the free online Victorian Translocation Symposium which was held over two half days on 21 and 28 July 2022. We had 26 experts and experienced practitioners in plant translocations present recent work during the Symposium. This attracted an audience of 299 registrants with around a third of these attending the live events. We were also able to provide recordings of the Symposium on our ANPC YouTube channel and these have been viewed 495 times. Thank you to everyone who joined us and for all our fantastic speakers, we appreciate you spending your time to share your expertise with our community.



Murnong (*Microseris scapigera*) – the subject of one of the Plants Going Places videos. Photo: Michael Lawrence-Taylor

3rd edition of the Germplasm Guidelines

<https://www.anpc.asn.au/plant-germplasm/>

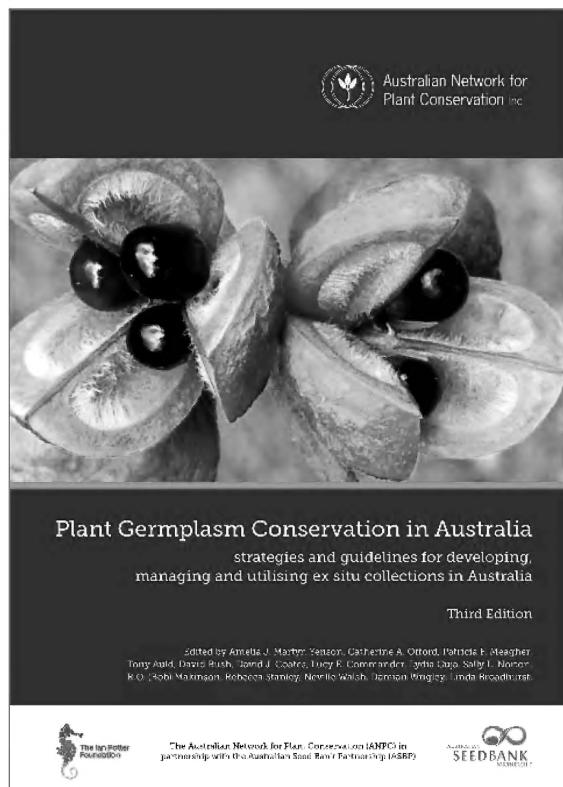
As mentioned in my report last year, the third edition of the ANPC's Germplasm Guidelines was released in September 2021 and as of June 2022 at project completion had more than 700 downloads. 'Plant Germplasm Conservation in Australia - strategies and guidelines for developing, managing and utilising ex situ collections' was a joint publication of the ANPC and the Australian Seed Bank Partnership, and was supported by The Ian Potter Foundation.

In 2022, we undertook extensive promulgation of the Guidelines which included four webinars, a video series and three conference presentations, as well as the second day of the Australian Academy of Science Fenner Conference on the Environment in June. Through these opportunities we have reached a wide range of audiences engaged in conservation, both in Australia and internationally. We were able to highlight best practice and amplify the contribution of many organisations engaged in *ex situ* plant conservation.

Evaluation of the Guidelines' impact indicates that we are influencing practical conservation activities as well as provoking conversations on best practice within and between organisations. The Guidelines are already being cited in review papers, as well as papers referring to techniques such as dormancy classification (Emery and Collette 2021) and concepts around collection utilisation (Breman *et al.* 2021). It has been cited in reports on forest genetic resources in Australia (Lott and Read 2021) and the Strategy for the Australian Native Seed Sector developed from Project Phoenix (Van Moort *et al.* 2021).

It's also referred to, along with the ANPC's Translocation Guidelines, in the Threatened Species Action Plan 2021–2026, with an action under Target 8 to: "Support and promote best practice guidelines for key recovery actions (including the use of...protocols for translocations, *ex situ* conservation and seed collection)."

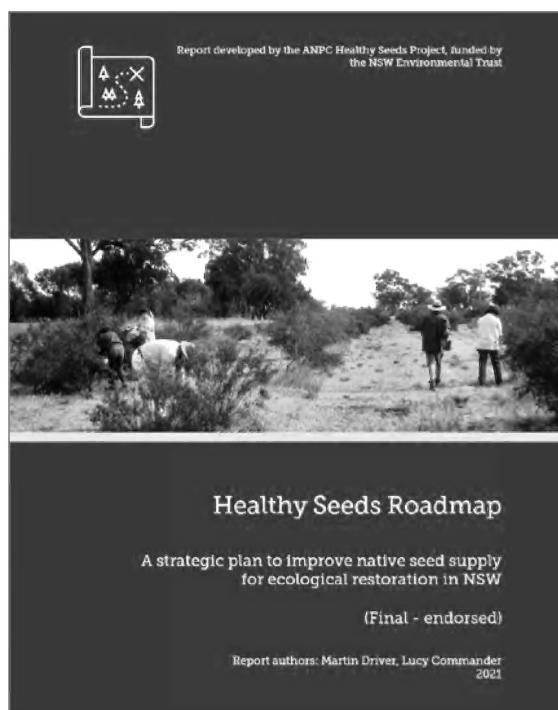
The Germplasm and Translocation Guidelines are also starting to be incorporated into national plant Conservation Advices (CAs), including drafts on public exhibition for *Pultenaea rodwayi*, *Leionema westonii* and *Leionema coxii* (e.g., DAWE 2021).



Healthy Seeds

<https://www.anpc.asn.au/healthy-seeds/>

Stage 1 of the Healthy Seeds project, funded by the NSW Environmental Trust was completed in December last year. One outcome of this project was the '*Healthy Seeds Roadmap - A strategic plan to improve native seed supply for ecological restoration in NSW*' which was formally adopted by the Trust this year. A four-page summary of the Roadmap is also available. We are now working with the Trust on the planning stage for the development of Stage 2.



Key recommendations of Healthy Seeds Roadmap:

1. Coordination: Co-ordinate seed supply and demand, plan restoration, identify infrastructure and seed production needs, provide training, and communicate research needs and outcomes at state and regional levels.

2. Licensing and record keeping: Ensure that licensing systems are more efficient, effective, useful and fit for purpose; licence applications have clear instructions, and achieve the aim of preventing over-harvesting and having a net positive environmental impact. Adopt and implement minimum standards for seed collection (including data collection) and use these to underpin regulatory approvals. Use appropriate record keeping systems and provide data to the buyer to improve transparency in seed quality.

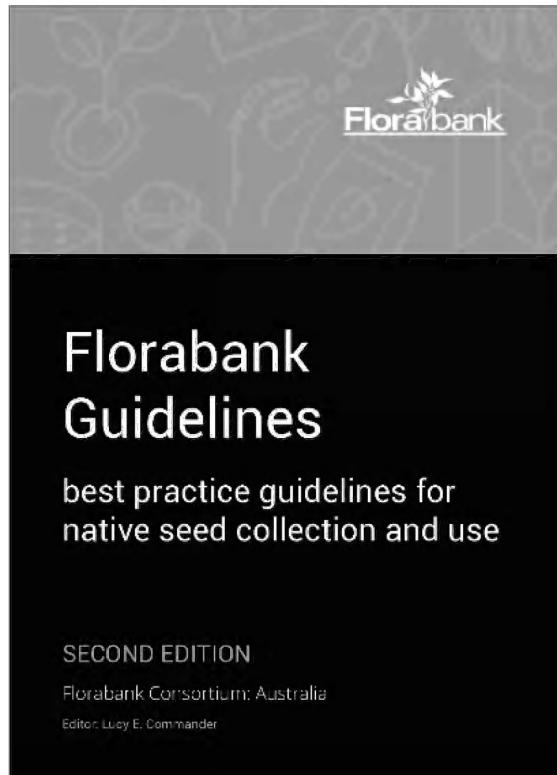
3. Project management: Restoration projects and funding models must take into consideration the logistics of the seed supply chain, the time required for seed sourcing, propagation (if needed), implementation and monitoring, as well as the variability of climate from year to year. In some cases, this may mean project budgets

and grant timelines should be extended from one year to five or more years.

4. Restoration planning: Co-ordinate and plan areas to be restored and seed requirements at a regional level to strategically plan resource allocation and forecast seed requirements. Assist restoration planning and inform seed collection requirements by developing vegetation guides for each region. Identify existing regional infrastructure (e.g. seed stores, seed production areas), and determine infrastructure requirements.

5. Training: Initiate and implement a sector-wide training program in seed literacy to improve restoration community capacity.

The ANPC is now a formal partner on the Florabank Consortium to oversee the promotion and implementation of the Florabank Guidelines which were updated and released last year as part of the Healthy Seeds project <https://www.florabank.org.au/guidelines>
<https://www.anpc.asn.au/florabank/>



Submissions

The ANPC continued to maintain its involvement in The UN Decade on Ecosystem Restoration 2021–2030 this year with 13 other Australian environmental organisations through the Restoration Decade Alliance a consortium that supports the goals of the UN Decade in Australia. The decade aims to halt the degradation of ecosystems and restore them.

In September 2022, the ANPC made a submission in response to the invitation issued by the Department of Climate Change, Energy, the Environment and Water to provide comment on the Government's proposal to develop a legislated framework to underpin a voluntary National Biodiversity Market. At this stage, the ANPC does not support the development of the National Biodiversity Market as it is unclear whether it will be set up to accommodate global best practice with a focus on avoidance in any proposed biodiversity offsetting, in addition to facilitating landholders' investment in conservation and restoration. There is a lack of evidence to show that offset schemes actually deliver predicted biodiversity outcomes. Assessing their effectiveness is difficult, not least because loss of habitat occurs immediately and any gains may take decades to be delivered effectively.

Experts have raised concerns about the effectiveness of biodiversity offsetting and its ability to deliver the anticipated environmental outcomes. Concerns relate to difficulties in quantifying biodiversity values for market purposes, and in establishing offset markets (i.e. supply and demand requirements), challenges in re-creating nature, time lags in restoring areas, failure to account for declining base lines, failures to effectively manage offsets sites and protect offset sites in perpetuity, and perverse outcomes. In particular, in NSW the very recent report of the Auditor General makes sobering reading. To date all the 'markets' have led to ongoing, if not increased, biodiversity decline without a reversal of past trends. Most schemes in Australia do not apply global best practices, for example, no more habitat loss for Critically Endangered species or Threatened Ecological Communities.

The Australian community continues to demonstrate strong interest and support for plant conservation. To meet these expectations, the ANPC is playing a key role in facilitating and communicating plant conservation initiatives and information across Australia. This is reflected in the ongoing participation of land managers, government departments, industry, botanic gardens, the volunteer conservation movement and the broader community in ANPC workshops and conferences as well as the requests we receive from other organisations and government agencies to participate in and comment on various flora conservation initiatives.

I continue to be greatly impressed by the dedication and breadth of knowledge of ANPC members, and staff. We still face many significant challenges for plant conservation in Australia and beyond. We need to ensure that we continue to effectively promote the inherent value and cultural significance of our unique and wonderful flora to the broader Australian community and remain true to our core business of facilitating Australian plant conservation, threatened species recovery, ecological restoration and remnant vegetation management.

APCC13 Conference 'Seeds to recovery'

<https://www.anpc.asn.au/conferences/apcc13/>

The 13th Australasian Plant Conservation Conference was originally due to be held in April 2021 in Albury NSW but was postponed due to COVID-19. The conference was held as a hybrid event with the in-person component hosted in Albury from 3 - 7 April 2022. We had 91 people join us at the Albury Entertainment Centre and a further 54 attendees online for the plenary sessions and workshops. Our conference opened with a Welcome to Country from Wiradjuri elder, Aunty Edna Stewart, followed by opening addresses from Albury Councillor Ashley Edwards, NSW Member for Albury Justin Clancy, and the Federal member for Farrer and the then Minister for the Environment, Sussan Ley. Dr Tony Auld gave the ANPC President's address before plenary sessions began.

Under the overarching theme 'Seeds to Recovery', 63 speakers and 13 posters covered topics under four conference subthemes (1) bushfire recovery, (2) seeds, (3) conservation of threatened species and communities and (4) engaging people with conservation /restoration. We also held two workshops with a series of short presentations, discussions, and polls on meeting ambitious restoration goals in the UN Decade on Ecosystem Restoration and selecting species and provenances (a showcase of tools, templates and approaches).

Our in-person attendees then had a choice of two field trips. One group set out to the west and visited seedbank

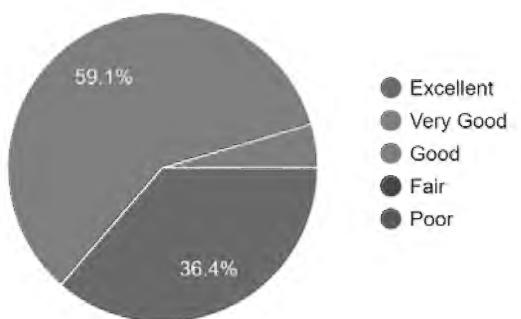
facilities in Deniliquin and looked at Seed Production Areas along the way. The other group set off east to look at the extent of recent wildfires and discuss associated restoration, weed incursion and grazing management. There was also a post-conference field trip to the Euroa Arboretum for a tour of the Seed Production Areas and Seedbank facilities.

Recordings of the conference were made available to delegates through our website for those who may have missed a session. A summary of the conference was published in APC and the ANPC Twitter page <https://twitter.com/ANPlantC> and Facebook page <https://www.facebook.com/AustralianNetworkForPlantConservation> also posted many photos from the week and a conference commentary for each session. Conference photos can be viewed at <https://www.flickr.com/photos/anpc/albums/72177720299048739>

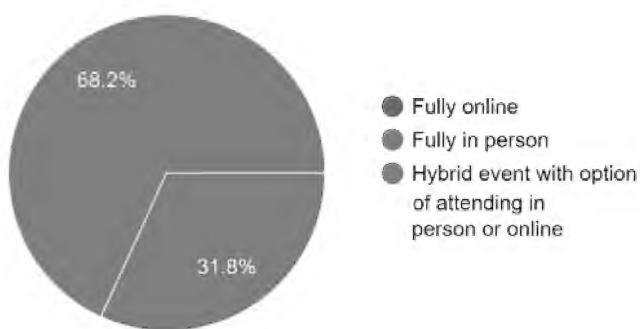
I would like to thank all our Conference partners <https://www.anpc.asn.au/conferences/apcc13/partners/> and the conference organising committee for all their time and hard work organising this conference: Ros Walls and Rachael Orr (AlburyCity); Phil Falcke (North East CMA); Jim Begley (Goulburn Broken CMA); Jodi Price (Charles Sturt Uni); Damian Wrigley (ASBP); Natasha Lappin (Murray LLS); Singarayer Florentine (Federation Uni); Judy Kirk (Wooragee Landcare); and ANPC staff Martin Driver, Lucy Commander, Amelia Martyn Yenson, Christine Fernance and Jo Lynch. We look forward to seeing everyone again for the 14th Australasian Plant Conservation Conference to be held in 2024!



Top: all in person delegates. Bottom: screenshots of our panelists from workshop 1 (left) and workshop 2 (right). Photos: Chris Fernance



Overall, how would you rate the APCC13 conference?



For future conferences, which would you prefer?

We received some great delegate feedback in our Evaluation Survey on the themes and presenters (as well as the catering!). We really appreciated this and for the next conference we will be focusing on making the workshops more interactive, facilitating more formal networking and mixing in activities to break up the day.

"Made valuable connections with collaborators!"

"Learnt a lot out of many of the presentations - but often it was the conversation afterwards that led to the exciting conversation"

"Net working with other professionals"

"Networking with other seed practitioners was very important to me."

"better understanding the depth of research going on and the effort being put in to save endangered species"

"I developed networks beyond the scope of my current position that could provide additional opportunities for collaboration."

"Conservation success depends on collaboration!"

"As a landholder with a conservation agreement what I like most about the conferences is keeping up with what's happening in the science and conservation strategies being used."

"Connecting with other people doing similar work"

"I enjoyed the balance of scientific and on ground presentations"

"Great work by the organisers and the mix of online and in-person worked really well, the conference venue staff did a great job."

Workshops and outreach

'Plant Treasures' video series

<https://www.youtube.com/c/AnpcAsnAu/playlists>

The Ian Potter Foundation grant along with WWF and Botanica by Air Wick (through the ASBP's The Rare Bloom Project™) provided funding to produce a total of nine videos to promote and share the new Germplasm Guidelines and its content. The videos, listed below, include interviews with chapter authors and footage of *ex situ* conservation processes in action and were produced by Chantelle Doyle and Michael Lawrence-Taylor.

- Plant Treasures: introduces the Guidelines – why they were updated and what is included in the new edition – and showcases the *ex situ* conservation of Australia's national plant treasures.
- Assessing seed storage behaviour: identification of non-orthodox seeds and alternatives to seed banking.
- The role of the nursery and living collections in *ex situ* conservation.
- Using *ex situ* collections of Australian native species: Translocation and other end uses.

13th Australasian Plant Conservation Conference 'Seeds to recovery'



Australian Network for
Plant Conservation Inc

Sun 3 - Thurs 7
APRIL 2022
Albury NSW - and online





Albury City



AUSTRALIAN NATIONAL
BOTANIC GARDENS



WOOLGOOLGA
LANDSCAPE
DISTRICT COUNCIL



Charles Sturt
University



AUSTRALIAN
SEEDBANK
PARTNERSHIP



GOULBURN
BROKEN
CATCHMENT
MANAGEMENT
AUTHORITY



NORTH EAST
CATCHMENT
MANAGEMENT
AUTHORITY



Federation
University
NSW



Local Land
Services

- Techniques including: cutting propagation, collection and processing of fern spores and using differential scanning calorimetry (DSC) to identify freezing-sensitive seeds.
- Some light-hearted musings from authors of the guidelines.
- Images of Australia's diverse flowers and seeds.



'Plant Treasures – in conversation' webinar series

<https://www.youtube.com/c/AnpcAsnAu/playlists>

Four webinars were held between February and June this year on different aspects of the Germplasm Guidelines, co-hosted with the support of the Botanic Gardens Australian and New Zealand (BGANZ) Collections and Records Management group (BCARM). Themes included:

- data collection and record keeping.
- biosecurity in *ex situ* collections.
- the role of the nursery and living collections in conserving native plants species (3 hr special).
- an introduction to seed testing and germination.



Thank you to everyone who joined us at these webinars and to all our fantastic speakers, we appreciate you spending your time to share your expertise with our community. A special thank you to Emma Simpkins (nee Bodley) of BCARM for hosting these sessions, and the BGANZ Communications staff Sam Moon and Rebecca Harcourt for their support.

Australian Academy of Science Fenner Conference on the Environment 'Exceptional Times, Exceptional Plants'

We held Day 2 of the Australian Academy of Science Fenner Conference on the Environment as a hybrid event from the Shine Dome, Canberra on 2 June 2022 (by invitation only). This was funded by the Australian Academy of Science Fenner Conference on the Environment grant and The Ian Potter Foundation (IPF). We had 14 people attend for the full day, four people attend for part of the day, and 26 people attend online either from work/home or hubs in WA, Vic or NSW. We started the day with a speech from IPF Senior Project Manager, Louise Arkles, and an evaluation of the Germplasm Guidelines project outputs and impact, with polls to capture audience feedback about how the Guidelines are/will be used and how we can continue sharing the content. We continued with welcomes from Dr TJ Higgins on behalf of the AAS and Jacqui Goonrey, Director of the Office of the Threatened Species Commissioner.

The rest of the day was dedicated to discussion and activities about plants that require complementary methods of *ex situ* conservation, in addition to seed banking, and the types of habitats and threat combinations that require prioritisation of these methods

for both threatened and at-risk species. We plan to use the evaluation session in our reporting and strategic planning for ANPC; and the exceptional species discussion to write up a scientific paper in the next year. Recordings were made available to all attendees. Thanks to Amelia, Chris, Jo and the Germplasm Guidelines steering committee for all their assistance in planning and on the day.



(Top) Delegates of the Australian Academy of Science Fenner Conference on the Environment outside the Shine Dome, Canberra. Credit Jo Lynch and (bottom) screenshot of delegates during the Conference.

'Plants Going Places' video series

<https://www.youtube.com/c/AnpcAsnAu/playlists>

Three videos have been released, with accompanying podcasts, which explore the translocation in the Melbourne region of the following plants:

1. Spiny Rice-flower (*Pimelea spinescens* subsp. *spinescens*) – explores the successes and failures of mitigation translocations when a threatened plant is growing in an intended development location. We explore the question: Do offsets really work? The Spiny Rice-flower is arguably Australia's most salvaged plant and has a few valuable lessons to teach – about ecology, collaboration and open accessibility of knowledge.
2. Murnong (*Microseris scapigera*) – a type of Yam Daisy. For the Wurundjeri Woi Wurrung and other Aboriginal groups in south-eastern Australia, Murnong has been an important cultural food source for thousands of years. But today only three populations remain in Melbourne.



Debbie Reynolds (Trust for Nature) being interviewed for the Spiny Rice-flower video. Image: Michael Lawrence-Taylor

3. The popular plant family – orchids. With their specialised biology and pollinator-specific associations, orchids have gained a reputation for being difficult to propagate. This video discusses how to grow and restore orchid populations when faced with many challenges.



Dr Noushka Reiter (Royal Botanic Gardens Victoria) being interviewed on the Orchid video. Image: Michael Lawrence-Taylor

'Plants Going Places' Victorian Translocation Symposium

<https://www.anpc.asn.au/news/plants-going-places-translocation-symposium/>

This free online Symposium was held over two half days on 21 and 28 July 2022. The intention was to hold three in-person workshops in Victoria in early 2022, however we needed to pivot to online due to ongoing COVID-19 concerns at the time. We had an excellent line up of 26 experts and experienced practitioners in plant translocations provide a variety of presentations on their recent work during the Symposium. This attracted a wide range of 299 registrants. We were also able to provide recordings of the Symposium on our ANPC YouTube channel and these have been viewed 495 times. Thank you to everyone who joined us and for all our fantastic

speakers, we appreciate you spending your time to share your expertise with our community. The results of the evaluation survey were very positive and we look forward to being able to hold similar events in the future.

"The facilitator was marvellous, her enthusiasm shone through. Every speaker sharing their passion made for informative, specialised, quality education."

"The range of topics/speakers was excellent."

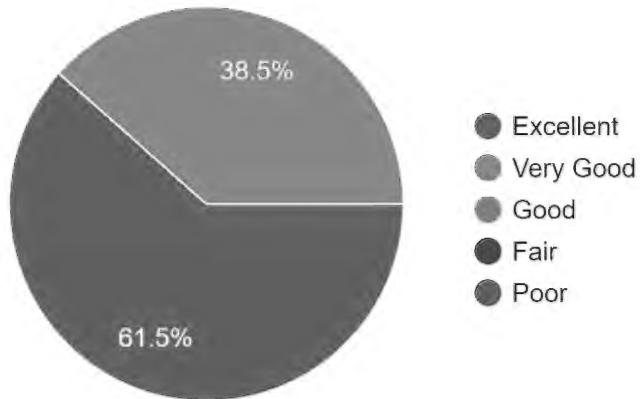
"It's great that it was free and available to all interested parties"

"Lots of food for thought and inspirational hearing about various projects and outcomes."

"Each presentation addressed different aspects of translocation and so conveyed a diversity of different techniques, opportunities and stories. It was valuable to highlight that translocation looks different for each species."

"It's great to have a forum whereby experts can freely share their knowledge and open opportunities to network and connect in a professional manner"

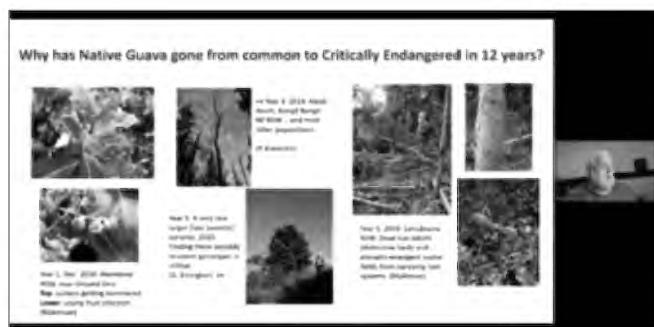
"a great job of coordinating all the speakers and providing enthusiastic commentary in between talks".



Overall, how would you rate the Symposium?

Online training in Myrtle Rust for Native Guava project

The ANPC undertook online training for botanic garden personnel working on the Native Guava project on 19 August 2022, and it was recorded and made available to those who could not attend on the day. A big thank you to Amelia Martyn Yenson for coordinating the training and to Bob Makinson (ANPC), Craig Stehn (DPE) and Veronica Viler (The Australian Botanic Garden Mount Annan) for their presentations on Myrtle Rust, project monitoring (using paper-based forms and the Epicollect app) and plant management including spraying. An evaluation survey recorded great feedback on the training. We look forward to hosting an open access webinar on Myrtle Rust in the first half of 2023.



ANPC's Bob Makinson presenting background information on Native Guava at the online training in Myrtle Rust.

Myrtle Rust information hub and donation drive

<https://www.anpc.asn.au/myrtle-rust/>

The ANPC's Myrtle Rust information hub was further developed and updated this year to continue our contribution to response capabilities both here in Australia and overseas. Myrtle Rust, an introduced fungal disease, is a major threat to Australia's flora. It infects hundreds of species in the Myrtaceae family. Since this disease was introduced to Australia in 2010, at least five native plants have jumped straight to the 'Critically Endangered' category as a direct result of the disease and are faced with extinction in the wild in the very near future.

The ANPC has been at the centre of attempts by concerned scientists and conservation practitioners to develop a coordinated and funded national response to this threat. Much of this work has been on a voluntary basis or at best a shoestring budget.

In early November we launched a Donation Drive to raise funds for our work on Myrtle Rust. You can donate to this urgent cause here <https://www.anpc.asn.au/donate/donation-drive-myrtle-rust/>



Dead Native Guava trees at Bongil Bongil National Park, NSW, 2013, only two years after the arrival of Myrtle Rust. In recent surveys in NSW and QLD, no adult trees remain of this once common rainforest plant. Image: Peter Entwistle

Conference presentations

Amelia Martyn Yenson (Project Manager):

- 13th Australasian Plant Conservation Conference (Albury, 3-7 April 2022) on Germplasm Guidelines.
- 1st International Plant Translocation Conference (online, held in Rome, 20-23 June) on Germplasm Guidelines.
- The National Landcare Conference (Sydney, 23-25 August 2022) on Germplasm Guidelines.
- The Germplasm Conservation Symposium at the 7th Global Botanic Gardens Congress (Melbourne, 25-30 September 2022) on Germplasm Guidelines.

Martin Driver (former Project Manager):

- 13th Australasian Plant Conservation Conference (Albury, 3-7 April 2022) on Healthy Seeds project and Roadmap.
- 13th Australasian Plant Conservation Conference (Albury, 3-7 April 2022) ran field trip #1 on seeds and restoration.

Lucy Commander (former Project Manager):

- 13th Australasian Plant Conservation Conference (Albury, 3-7 April 2022) on Florabank Guidelines and seed supply chain.
- 1st International Plant Translocation Conference from 20-23 June (online, held in Rome) on Translocation Guidelines.



(Top) Lucy Commander presenting at the IPCC13 and Chantelle Doyle presenting at the first International Plant Translocation Conference held in Rome.

Chantelle Doyle (former Project Manager)

- 1st International Plant Translocation Conference (Rome, 20-23 June), presented a perspective of Australian translocation practitioners. Won best presentation (as voted by her peers) and resulted in a review paper led by Chantelle with 20 authors from around the world and recently submitted to *Plant Ecology*, which discusses and suggests global mitigation translocation standards, and the need for databases.

Dr Lydia Guja (ANPC Committee member) and Dr Gemma Hoyle (both from ANBG)

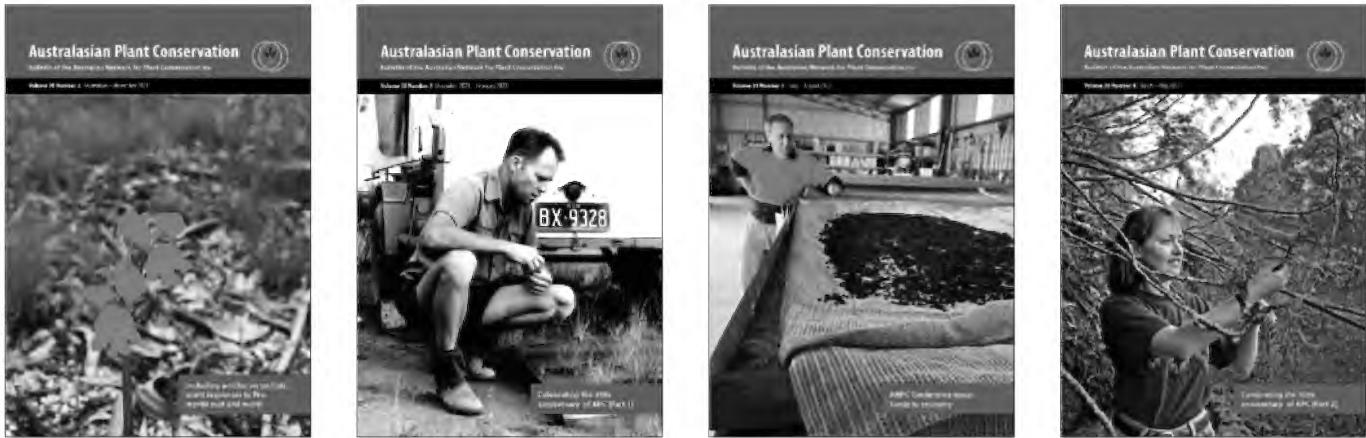
- 7th Seed Ecology Conference of the International Society for Seed Science (Spain, 6-9 September 2022). ANPC posters promoting the Translocation Guidelines, Florabank Guidelines and Germplasm Guidelines.



(left) Dr Gemma Hoyle presenting a poster on the recently revised Plant Germplasm Conservation in Australia and (right) Dr Lydia Guja presenting a poster on the recent publications revised by the ANPC.

Australasian Plant Conservation (APC)

APC, our quarterly bulletin, has continued to publish high-quality articles relevant to a broad range of plant conservation practitioners and managers, under the continued editorship this year of Heidi Zimmer and assistant editors Nathan Emery and Selga Harrington. This year, APC has featured a wide range of articles on orchids (following on from our Orchid Symposium in 2021), bushfire recovery, Myrtle rust, cryopreservation, need for an ecosystem restoration strategy, ANPC events and guidelines, regular news from the Australian Seed Bank Partnership as well as papers from our biennial conference in April 'Seeds to Recovery'. We were also proud to produce two special editions to mark the 30th anniversary of the ANPC. To celebrate this milestone, APC presented articles on the history of the ANPC along with members' retrospectives and reflections on plant conservation issues (and changes over the past 30 years).



I would like to sincerely thank Heidi, Nathan and Selga for all their efforts over the past year in ensuring that APC continues to be a quality and well-respected publication communicating Australasian plant conservation issues. Thank you also to the many authors who have contributed to these editions this year. The Spring 2022 edition which will be out soon, will be Heidi's last after four years, so a special thank you to her for all her efforts in making APC such an excellent source of information for plant conservation and a warm welcome to Nathan as the new editor.

Social media

Our outreach efforts continue to expand through social media with the regular sharing of news and events in plant conservation via Twitter, Facebook and LinkedIn. Regular posting has seen an increase in subscribers across all channels, our monthly email newsletter ANPC e-news now reaches over 1,000 subscribers. While our social media channel followers have grown by 6-10 percent.

We ran some paid promotional posts on Facebook which saw our YouTube subscriber number double and our promoted videos receiving 200-300 extra views.

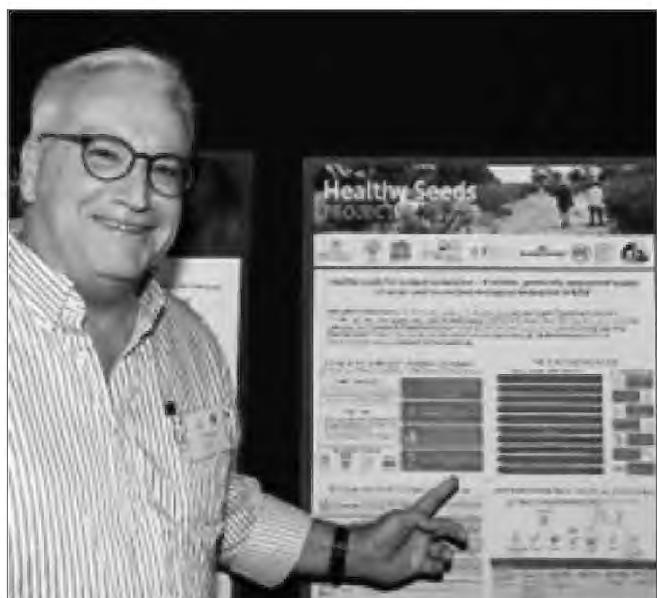
You may also have seen the ANPC's work was mentioned in the ABC's article "Invasive myrtle rust fungus poses 'unprecedented' risk to native trees", the Guardian's article "'Silent extinction': myrtle rust fungus spreads to WA's Kimberley" and The Sydney Morning Herald's article "Ten days to plant 6000 native orchids? Easy for army of volunteers".



Staffing

Many thanks to all our staff who work above and beyond the call of duty for the ANPC. Their dedication, advice and support make my role and the work of the Committee much more effective and ensures that the ANPC continues to function as a highly respected conservation organisation. It has been wonderful to see all the results of their excellent work come to fruition in 2022.

Martin Driver ended his role as the Healthy Seeds Project Manager in April. A huge thank you to Martin for managing the Healthy Seeds project, overseeing the Florabank Guidelines update and developing the Roadmap, which was approved by the Environmental Trust in July 2022; along with his tremendous assistance with the organisation of APCC13. He is continuing to work in an ex officio role on behalf of the ANPC currently liaising with the NSW Environmental Trust regarding the implementation of the Roadmap and the development of Stage 2 of the project.



Project Manager Martin Driver presenting the Healthy Seeds Roadmap poster at the 13th Australasian Plant Conservation Conference. Image: Christine Fernance

Dr Amelia Martyn Yenson led the promulgation of the Germplasm Guidelines this year, including the production of the Plant Treasures videos and webinars and various presentations. I also acknowledge her outstanding efforts facilitating the very successful Day 2 of the Fenner Conference. And on behalf of the ANPC, I'd like to congratulate Amelia on receiving the Marsh Award. Presented at the 7th Global Botanic Gardens Congress in September, Amelia received the 2022 Marsh Award for International Plant Conservation in recognition of her work managing the revision of the Germplasm Guidelines. The Marsh Award recognises an individual in the early to mid-stages of their career who has made a significant achievement in the conservation of rare and endangered plant species and plant diversity. Since June 2022, we are fortunate that Amelia has continued her work for the ANPC through managing the current federally funded Safe Custody of Native Guava project.



Project Manager Amelia Martyn Yenson with Native Guava planted at ANBG. Image: Zoe Knapp

We were fortunate to be able to employ Chantelle Doyle for a few months this year to plan and facilitate the highly successful online Victorian Plant Translocation Symposium.

Christine Fernance has continued to do a superb job as our Communications Manager this year, further growing the ANPC's reach via social media, ANPC e-news, project promotions, and implementing communication strategies for each project and the ANPC.

Our Business Manager, Jo Lynch, has continued her excellent work in the office with grant applications and reports, along with overall project and budget management. Sincere thanks to our office volunteer Robert Hawes, who has helped enormously with various administrative and financial tasks this year.

I am grateful to all the Committee members for their tremendous support over the year. All the Committee members have significant commitments outside the ANPC, and it is often challenging to devote the time required to be active committee members. The involvement in the committee by all members is a clear demonstration of their dedication to the ANPC and its goals in improving plant conservation. I would especially like to thank Meredith Cosgrove who is leaving the committee this year, and I sincerely thank her for her time and support.



From left: ANPC Project Manager and video producer Chantelle Doyle facilitating the ANPC's online Plants Going Places Victorian Plant Translocation Symposium, Chris Fernance and Jo Lynch.

Funding

Our financial situation will be reported on in detail separately at the AGM but our key sources of income this year have included:

- NSW Environmental Trust.
- The Ian Potter Foundation.
- Australian Government's Wildlife and Habitat Bushfire Recovery Program.
- San Diego Zoo Wildlife Alliance
- The Ross Trust
- Australian Academy of Science.
- Memberships and donations.

The hosting of the ANPC by the Australian National Botanic Gardens remains a crucial support for us, and a major contribution by the ANBG to the national effort for plant conservation. This includes provision of office space, computers, phones, electricity, furniture, and a printer. I would like to sincerely thank the Gardens for this support, and look forward to continuing this close relationship into the future.

The coming year

2023 will again be a very busy year for the ANPC as we plan to undertake the following:

- Develop a five-year strategic plan for the ANPC.
- Begin planning our 14th Australasian Plant Conservation Conference to be held in 2024.
- Continue surveys of threatened epiphytic orchids and other plant species affected by the 2019/20 fires.
- Further promulgate the Healthy Seeds Roadmap and plan for Stage 2 of the project.
- Organise a webinar on our Native Guava project, with a focus on Myrtle Rust and how *ex situ* conservation can help tackle this threatening process.
- Convene a post-fire plant recovery symposium.
- Undertake fundraising to build on our work on the Myrtle Rust threat.
- Seek further funding for essential projects and the ANPC Project Manager roles.
- Write up a scientific paper on exceptional species following the Fenner Conference held June 2022.
- Seek funding to update and maintain the Australian Plant Translocation Database that the ANPC hosts for free on our website.

I have really enjoyed this last year as President. It was great to finally be able to hold APCC13 in Albury and to spend time with people face-to-face, and to see the success of our past and current efforts, including the Fenner Conference and the Germplasm Guidelines. This year the ANPC again has a number of achievements to be very proud of and plant conservation endeavours are certainly keeping us very busy, and highly relevant. Thank you to everyone involved for your efforts that help build the ANPC as the go-to organisation for plant conservation. This highlights the ongoing strength of the organisation and those working for ANPC. Once again, I am privileged to work with all of you and for an organisation that does so much for plant conservation in Australia. As we begin new initiatives covering a broad range of topics, I know that the ANPC can continue to play a leading role in plant conservation across Australia and the region more broadly.

Appendix 1: References

Department of Agriculture, Water and the Environment (2022). Fire regimes that cause biodiversity decline as a key threatening process. Canberra, ACT.

Zylstra, P.J. (2021). Linking fire behaviour and its ecological effects to plant traits, using FRaME in R. *Methods Ecol. Evol.*, 12, 1365–1378.

Zylstra, P.J., Bradshaw, S.D.A. and Lindenmayer, D.B. (2022). Self-thinning forest understoreys reduce wildfire risk, even in a warming climate. *Environ. Res. Lett.*, 17, 044022.

Zylstra, P.J., Wardell-Johnson, G.W., Falster, D.S., Howe, M., McQuoid, N. and Neville, S. (2022a). *Ecological controls on flame height in southwest Australian forests*. In Review.

Appendix 2: Citations of the Germplasm Guidelines (3rd edition) as at 28 June 2022

Martyn Yenson AJ, Offord CA, Meagher PF, Auld TD, Bush D, Coates DJ, Commander LE, Guja LK, Norton SL, Makinson RO, Stanley R, Walsh N, Wrigley D, Broadhurst L (Eds.) (2021) 'Plant Germplasm Conservation in Australia: strategies and guidelines for developing, managing and utilising *ex situ* collections. Third edition.' Australian Network for Plant Conservation, Canberra. Available at <https://www.anpc.asn.au/plant-germplasm/>

Citations in academia and policy

The Guidelines are already being cited in review papers, as well as papers referring to techniques such as dormancy classification (Emery and Collette 2021) and concepts around collection utilisation (Breman *et al.* 2021). It has been cited in reports on forest genetic resources in Australia (Lott and Read 2021) and the Strategy for the Australian Native Seed Sector developed from Project Phoenix (Van Moort *et al.* 2021).

It's also referred to, along with the translocation guidelines, in the Threatened Species Action Plan 2021–2026, with an action under Target 8 to: "Support and promote best practice guidelines for key recovery actions (including the use of...protocols for translocations, *ex situ* conservation and seed collection)."

The Germplasm and Translocation Guidelines are starting to be incorporated into national plant Conservation Advices (CAs), including drafts on public exhibition for *Pultenaea rodwayi*, *Leionema westonii* and *Leionema coxii* (e.g., DAWE 2021). All the 125 CAs that UNSW will be doing for post-2019/2020 impacts will have both Germplasm and Translocation Guidelines references.

Breman E, Ballesteros D, Castillo-Lorenzo E, Cockel C, Dickie J, Faruk A, O'Donnell K, Offord CA, Pironon S, Sharrock S, et al. (2021) Plant Diversity Conservation Challenges and Prospects—The Perspective of Botanic Gardens and the Millennium Seed Bank. *Plants* 10, 2371. <https://doi.org/10.3390/plants10112371>

DAWE (2021) Conservation advice for *Leionema coxii* (Cox's leionema), Canberra. This publication is available at the SPRAT profile for *Leionema coxii* (Cox's leionema).

Emery NJ, Collette JC (2021) Seeds of the threatened dry rainforest tree *Cadellia pentastylis* (Surianaceae) are non-dormant. *Seed Science Research* 31, 333–337. <https://doi.org/10.1017/S0960258521000301>

Hardstaff LK, Sommerville KD, Funnekotter B, Bunn E, Offord CA, Mancera RL (2022) Myrtaceae in Australia: Use of Cryobiotechnologies for the Conservation of a Significant Plant Family under Threat. *Plants* 11, 1017. <https://doi.org/10.3390/plants11081017>

Lott R, Read SM (2021) *Status of Australia's Forest Genetic Resources 2021. Australia's Country Report for The Second Report on the State of the World's Forest Genetic Resources*. Prepared for the Food and Agriculture Organization of the United Nations. ABARES Research Report 21.15. November 2021, Canberra. CC BY 4.0 <https://doi.org/10.25814/dnv3-vj64>

Turner SR, Cross AT, Just M, Newton V, Pedrini S, Tomlinson S, Dixon K (2022) Restoration seedbanks for mined land restoration. *Restoration Ecology* e13667. <https://doi.org/10.1111/rec.13667>

Van Moort JP, Lobb A, Baker L (2021) A Strategy for the Australian Native Seed Sector. Project Phoenix, Greening Australia: Melbourne, Victoria. <https://www.greeningaustralia.org.au/project-phoenix-resources/>

Appendix 3: Selected publications co-authored by ANPC staff and President

Auld TD, Keith DA (2022) Plant conservation in Australia. *Australasian Plant Conservation* 30(4): 3-6.

Auld TD et al. (in press) Frameworks for identifying priority plants and ecosystems most impacted by major fires. *Australian Journal of Botany* (in press).

Commander LE, Martyn Yenson AJ, Coates DJ, Bradbury K, Makinson B, Offord CA, Broadhurst L, Auld T, Gibson-Roy P (2022) Why Australia needs an Ecosystem Restoration Strategy. *Australasian Plant Conservation* 30(4): 13-18.

Keith DA, Allen SP, Gallagher RV, Mackenzie BDE, Auld TD et al. (2022) Fire-related threats and transformational change in Australian ecosystems. *Global Ecology and Biogeography* 31: 2070-2084.

Funnekotter B, Bunn E (2022) Cryopreserving plants for long-term conservation. *Australasian Plant Conservation* 30(4): 8-10.

Gallagher, R., et al. and Auld, T.D. (2022). An integrated approach to assessing abiotic and biotic threats to post-fire plant species recovery: lessons from the 2019-20 Australian fire season. *Global Ecology and Biogeography* 31: 2056–2069.

Martyn Yenson AJ, Nadarajan J, Funnekotter B, Sommerville KD (2022) Australian Academy of Science Fenner Conference on the Environment 'Exceptional Times, Exceptional Plants'. *Australasian Plant Conservation* 30(4): 26-29.

Scobie K (2022) Conserving priority species at the Australian National Botanic Gardens. *Australasian Plant Conservation* 30(4): 10-12.

Assessing the impacts of drought on *Micromyrtus grandis*

ADAM FAWCETT^{*1}

¹NSW Department of Planning and Environment, Armidale.

*Email: adam.fawcett@environment.nsw.gov.au

Introduction

The Severn River heath-myrtle (*Micromyrtus grandis*) is a small tree to 6 metres tall, listed as Endangered under the *NSW Biodiversity Conservation Act 2016* and the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*. The species has a highly restricted distribution, growing on shallow soils on porphyritic outcrops adjacent to the Severn River, north-west of Glen Innes NSW (Hunter *et al.* 1996). There has been limited monitoring of the species undertaken since the original description of the species by Hunter *et al.* (1996). The critical threats identified for this species include grazing from feral herbivores and inappropriate fire regimes (DPE 2022).

While the majority of the *Micromyrtus grandis* population is conserved within Severn River Nature Reserve, there

is limited information on the species response to either planned or unplanned fire and severe drought. The 2017-2019 drought followed by the 2019-2020 bushfires prioritised the need for an updated population estimate and status of the species as part of the NSW Government's Saving Our Species (SOS) program.

Methods

A formal population census and monitoring plan has not yet been developed for *Micromyrtus grandis*. This population assessment was aimed at gaining a more accurate understanding of the species distribution, population size and the impacts of the recent drought and other threats across Severn River Nature Reserve.



Figure 1. Mature *M. grandis*, Severn River Nature Reserve.
Photo: Adam Fawcett



Figure 2. Close-up photos of flowers of *M. grandis*.
Photo: Adam Fawcett



Figure 3. Drought impacted stand of *M. grandis*.
Photo: Adam Fawcett

Surveys were undertaken over three separate days in August and September 2020, targeting known populations based on existing Bionet records (DPE 2020) and using a random meander transect to include surrounding areas of likely habitat. Plants were counted within 20m of the transect, noting their health, evidence of stress or mass plant deaths and any other obvious impacts from critical threats. The number of dead plants within each stand was estimated in the field to gain an understanding of the overall impact of the drought.

Population assessment and drought impacts

Surveys covered an extensive area (245 ha) of the reserve within suitable habitat. Overall, a total population of 987 plants was counted. While this is likely to still be an underestimate it provides a clearer picture of the distribution of the population within the reserve, combined with estimates provided by Hunter *et al.* (1996).

Average annual rainfall data indicated that the district experienced significant rainfall deficits during the 2017-2019 drought at Glen Innes, Inverell and Ashford, the closest weather stations to the site (BOM 2022).

The number of dead plants noted as part of the population assessment indicated the population had declined by ~15% across the survey area. Stands of *Micromyrtus grandis* occurring on west facing slopes tended to have suffered the greatest amount of drought stress and death compared to more sheltered positions but drought stress was still evident across all aspects (Adam Fawcett *pers. obs.*). Overall, the species appears to have been reasonably resilient to the drought conditions, with no major declines noted before June 2019 (Peter Croft *pers. comm.*). There were no obvious signs of recovery during these surveys or recruitment noted. However, a large proportion of the population was flowering at the time of these surveys.

Potential susceptibility to fire

Fortunately, Severn River Nature Reserve was not impacted by the 2019-2020 bushfires and response to wildfire by *Micromyrtus grandis* remains unknown. However, a small stand of five *Micromyrtus grandis* plants were very lightly burnt as part of a planned hazard reduction burn conducted in July 2018 (Peter Croft *pers. comm.*). The planned hazard reduction burn was conducted to reduce fuel loads within the reserve to the south of the main population, and was implemented effectively. The five plants were an unknown population that was located during the initial ignition. While the five plants were only briefly touched by a light run of the fire before it was suppressed, all five plants were noted to have been impacted, if only very lightly (Peter Croft *pers. comm.*).

Inspections at the time of these surveys found no sign of post-fire resprouting or recruitment of these five plants (Adam Fawcett *pers. obs.*). These observations raise concerns over the potential for the species to be fire sensitive and the need for fire to be excluded from the population to ensure its longevity. There is limited information available on the fire ecology of genus *Micromyrtus*, with some species known to be sensitive to fire and thought to be obligate seeders, potentially requiring fire to encourage germination (Bean 1997; Benson and McDougall 1998). Further assessment of the relationship with fire will need to be undertaken.

Other critical threats

Another critical threat assessed during the surveys was the impact of feral herbivore browsing, principally from feral goats and deer, across the population. Obvious browsing impacts were noted to be low across the population, estimated to be less than 1% of all plants observed. No goats were observed during surveys although some sign was evident. Severn River Nature Reserve is included in a strategic integrated feral herbivore control program, targeted to protect populations of *Astrotricha roddii* and *Micromyrtus grandis*. These results suggest that the feral herbivore control program is maintaining these pest animals at low densities and alleviating impacts on these species.

Conclusions

The population of *Micromyrtus grandis* within Severn River Nature Reserve is far more extensive than originally recorded. Hunter *et al.* (1996) estimated 1500 plants over an area of ~4ha compared to the 987 plants recorded over 245 ha observed during this study. The more extensive population recorded provides more security for the species but also increases the management cost and approaches needed to be implemented for this species.

The estimated loss of ~15% of the population to drought stress is a concern as the species is noted to be drought tolerant (ANBG 2022). Given the severity of the 2017-2019 drought, increased monitoring is likely needed during the next dry seasons to monitor the population and determine the point at which drought stress impacts the population. Fire management is also likely to play an important part in the future management of the population. While *Micromyrtus* species are known to be killed by wildfire, *M. grandis* is thought to recover post-fire from the soil seedbank, with germination possibly triggered by fire. Further assessment of this aspect of the ecology of the species is needed to help inform management within the reserve.



Figure 4. Evidence of browsing by herbivores on *M. grandis*.
Photo: Adam Fawcett

The implementation of formal population monitoring is planned to be undertaken within the next 12 months for *Micromyrtus grandis*. This will include the preparation of a monitoring, evaluation and reporting (MER) plan to guide the ongoing management of the species as part of the SOS program. The MER plan will include measures to assess all critical threats including impacts of introduced herbivores, drought and fire.

While the population of *Micromyrtus grandis* did experience some loss during the last drought, it was positive to see the amount of grazing by feral herbivores was minimal. With a better understanding of the species' germination triggers, it is likely the ongoing management of this species within Severn River Nature Reserve can maintain the population over the long term.

Acknowledgements

This project is funded by the NSW Government through the Saving Our Species program. Surveys were conducted by the author with the support of Peter Croft, NSW National Parks and Wildlife Service. Piers Thomas, NSW National Parks and Wildlife Service, provided comments on the draft manuscript.

References

Australian National Botanic Gardens (ANBG) (2022). *Growing Native Plants – Micromyrtus grandis*. Available at: <https://www.anbg.gov.au/gnp/interns-2005/micromyrtus-grandis.html>. Accessed 14 August 2022.

Bean, A.R. (1997). A revision of *Micromyrtus* Benth. (Myrtaceae) in Queensland. *Austrobaileya* 4 (4): 464-466.

Benson, D. and McDougall, L. (1998). Ecology of Sydney plant species: Part 6: Dicotyledon family Myrtaceae. *Cunninghamia* 5(4): 809-987.

Bureau of Meteorology (BOM) (2022). *Climate Data Online*. Available at: <http://www.bom.gov.au/climate/data/index.shtml>. Accessed 14 August 2022.

Department of Planning and Environment (DPE) (2020). *NSW Bionet*. Available at: <https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet>. Accessed 28 February 2020.

Department of Planning and Environment (DPE) (2022). *Severn River heath-myrtle – profile*. Available at: <https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10528>. Accessed 14 August 2022.

Hunter, J.T., Quinn, F.C. and Bruhl, J.J. (1996). *Micromyrtus grandis* (Myrtaceae), a new species from New South Wales. *Telopea* 7(1): 77.

New records of endangered desert cow-vine *Ipomoea diamantinensis* after summer flood on the Narran River, New South Wales

DARREN SHELLY*¹

¹NSW Department of Planning and Environment, Dubbo.

*Email: Darren.shelly@environment.nsw.gov.au

Introduction

Ipomoea diamantinensis is an annual prostrate creeper with distinctive arrowhead-shaped leaves and relatively large drupe fruits (to 17mm diameter) that distinguish it from other species of the same genus (Johnson 1992). Tendrils can grow up 7m in length with plants often rooting at the nodes.

In New South Wales (NSW), the species is associated with watercourses, as well as depressions and gilgais on adjacent floodplains on grey cracking clay soils.

Australian Virtual Herbarium records show *I. diamantinensis* occurs across northern Australia throughout central and western Queensland, the northern half of the Northern Territory and northern Western Australia. Records in NSW are at the southern-most limit of the species' distribution.

A search of the NSW Bionet database in February showed that prior to 2022, there were only 10 records from within NSW, with the Narran River having the majority. The species has also been recorded on the Warrego River near Ennagonia in 2010, and once from the Cuttaburra Channels near Yantabulla in 2021.

Narran River records are known from near Angledool in 1978, but most are from the area on either side of the Bangate Bridge crossing of the Narran River on the Bangate Road to the east of Goodooga in 1978, 2001, 2004 and 2020.

The species is listed as Endangered under the NSW *Biodiversity Conservation Act 2016* but is not listed at the Commonwealth level.

Recorded plant abundances

NSW Bionet database records indicate that plant abundances have never previously been observed to be high.

The 2010 record from the Warrego River noted a number of plants were spread over an area of 5-6km while the 2021 record from the Cuttaburra Channel and the two 1978 records from Angledool on the Narran River were of a single plant. The 2001 record from the Narran River at Bangate Bridge was of two plants, however the other

Narran River records from that locality gave no indication of numbers.

Stretches of the Narran River starting at the bridge locations and going downstream were searched by Gavin Phillips of the Royal Botanic Gardens in November 2016 without finding any plants (G. Phillips *pers. comm.*). The author searched the same area and an additional 20 km further south in January 2017 and did not locate the species.

In November 2020, Gavin Phillips found several hundred plants at the Bangate Bridge area within recently dry depressions in lignum (*Duma florulenta*) swamp above the banks of the river. Plants were described as being desiccated with withered foliage but with plentiful fruit, and forming large mats of several metres across. Seeds were collected from over 50 plants (G. Phillips *pers. comm.*).

14-18 February 2022 record observations

Location and Conditions

The author undertook searches along a 31km stretch of the Narran River south of the Bangate Bridge. Searches were only made along the western side of the river, as the Narran was flowing after flooding between mid-December 2021 and early January 2022. Overall, soil moisture on the floodplains was maintained by several rainfall events over the same period; however, at the time of survey the surface was generally dry with water only remaining in the deeper depressions, as pools in cut-off meanders on the river and in the river itself.

Topography

Ipomoea diamantinensis was found at numerous locations along the river, with plants observed along the top of the bank and just over the high bank. Abundance varied from single small plants to clusters of small plants and large individual plants with tendrils up to 4 m long. In these cases, plants were growing in small patches of bare ground, or more typically within and over the dense tall grass cover that had grown in response to the flooding. Plants could be found from the top bank out to approximately 40m. No plants were recorded from within

the river channel or from the bed itself, even though the current water level was low and numerous other groundcover species were growing there.

Considerably higher plant abundances were found in previously flooded cut-off meanders, where large belts of *I. diamantinensis* were the dominant groundcover species occupying stretches up to 100m on either side of the meander banks, as well as scattered individuals and small clusters within dry meander channels. In these locations, the species was growing over dead black roly-poly (*Sclerolaena muricata*) that had drowned when the meanders were inundated.

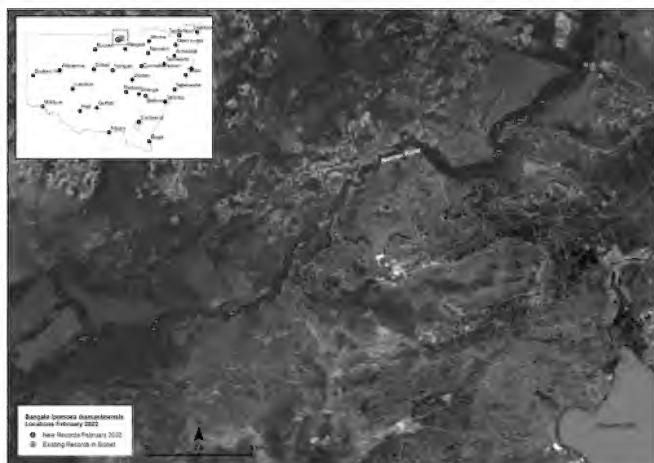


Figure 1. New and previous *Ipomoea diamantinensis* locations on the Narran River, February 2022.



Figure 2. *Ipomoea diamantinensis* growing on riverbank, Narran River. Photo: Darren Shelly



Figure 3. Large *Ipomoea diamantinensis* growing at top of riverbank. Photo: Darren Shelly

Plant condition

All plants were flowering and fruiting. This regeneration event will likely contribute large amounts of seed to the soil seed bank for the next flood event to germinate and potentially disperse seed further downstream.

Vegetation

The bankside overstorey vegetation of the Narran River was coolibah (*Eucalyptus coolabah*) open woodland with occasional river red gum (*E. camaldulensis*). Understorey trees varied from patches of river cooba (*Acacia stenophylla*) to eurah (*Eremophila bignoniiflora*) with increasing distance away from the channel. The shrub layer was dominated by patches of lignum. At the time of survey, the top of the riverbank and under the riparian trees were covered in dense grass dominated by Warrego summer grass (*Paspalidium jubiflorum*) and yabila grass (*Panicum queenslandicum*). The Narran River channel itself had a vegetation cover of rats-tail couch (*Sporobolus mitchellii*) and numerous forbs such as raspwort (*Haloragis* sp.) and sneezeweed (*Centipeda* sp.) in addition to sedges (*Cyperus* sp.).

Cut-off meanders were typically vegetated by black roly-poly in the bed and lignum and scattered eurah along the banks. On the inundated floodplain areas, large areas were dominated by a second *Ipomoea* species, common cow-vine (*I. lonchophylla*) that grew over the now dead black roly-poly. These areas were typically treeless with several grass species being the only abundant living groundcover at the time of survey. This species typically occurred from 40 m off the riverbank and out on the floodplain to almost 1.5km off the river wherever inundation had occurred. The two *Ipomoea* species rarely co-occurred.

Soil

In all cases, plants were recorded on grey cracking clay soil.

Population Estimate

An estimate of *I. diamantinensis* abundance along the Narran River at this time is in the order of 3,000-4,000 plants. This figure was considered to be very conservative as many small plants would have been missed in the dense grass cover along the riverbanks, and the number of individual plants in dense mats was most likely underestimated. This abundance is by far the highest number of plants ever recorded in NSW.



Figure 4. Belt of *Ipomoea diamantinensis* growing on riverbank of a cut-off meander, Narran River. Photo: Darren Shelly

Threats

At the time of survey there appeared to be no direct threat to the species. Plants were found within areas fenced off from stock access, and also in areas that were open to both sheep and cattle grazing. The river corridor was also occupied by kangaroos, swamp wallabies and feral pigs, which could also be potential grazers on this species. Only a single plant was noted as having been recently grazed with several tendrils eaten off.

The obvious threat to the species is that it is linked very closely to water regime. These observations suggest that a summer flood that overspills the high banks is very beneficial for species recruitment. Therefore, a hydrological regime that ensures reliable flows and intermittent flooding will ensure the long-term persistence of this species.

Acknowledgements

Members of the Narran Hunting Club – Steven Reilly, Bruce Melville, David Beal and Paul Hanson – assisted with the survey.

Special thanks to the landholders who allowed access to their property over a number of years for both recreational and threatened species related purposes.

Thanks to Helen Knight (Department of Planning and Environment, Dubbo) for producing the map of species records.

References

Johnson, R.W. (1992). Convolvulaceae. In: Harden, G.J. (ed) *Flora of New South Wales Volume 3*. pp. 378-381. New South Wales University Press, Kensington.

Department of Planning and Environment (DPE) (2022). NSW Bionet database. Sourced 1 February 2022: <http://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet>

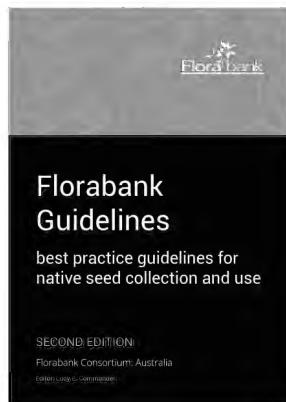
Florabank Guidelines

best practice guidelines for native seed collection and use

Second Edition 2021 | Editor: Lucy E. Commander
Florabank Consortium: Australia.

The second edition updates the original Guidelines, incorporating new information generated by a further 20 years of research and practice.

For more information and to order, go to www.anpc.asn.au/florabank/



Case study: Threatened plant translocation

Leichhardtia coronata (Slender milkvine), Apocynaceae

PETER MOONIE^{*1}, JENNIFER COLEMAN², JUSTIN SANDERSON³ AND CARLY SUGARS¹

¹ Red Ash Consulting, Bundaberg, QLD.

² Noosa District Landcare Group, Noosa, QLD.

³ Department of Transport and Main Roads, Gympie, QLD

*Email: peter@redashconsulting.com.au

The Species

- Wiry, inconspicuous vine that exudes a milky white latex.
- Most commonly found in open eucalypt forests and rainforest margins.
- Endemic to south-east Queensland (Vulnerable under the Queensland Nature Conservation Act 1992).



Plate 1. *L. coronata* at impact site; Flowering specimen (bottom).
Photos: Jennifer Coleman

Threatening Processes

- Habitat loss and degradation from mining, urban development and timber harvesting.
- Weed invasion.
- Inappropriate fire regimes.

Deciding to translocate

The Queensland Department of Transport and Main Roads (TMR) has commenced works to upgrade and realign a 26 km section of the Bruce Highway, east of Gympie. Flora surveys conducted during the early planning stages identified several occurrences of *Leichhardtia coronata* within the project footprint. Translocation of impacted individuals was proposed as complete avoidance of the species was not possible due to design constraints and the species prevalence in the local area.

Aim of the translocation

The overarching objective of the translocation was to maintain the existing viability of the local population by re-establishing impacted individuals within a nearby suitable recipient site.

Translocation working group and key stakeholders

- TMR
- Queensland Department of Environment and Science (DES)
- Red Ash Consulting
- Noosa District Landcare Group (NDLG)

Biology and Ecology

- Perennial vine thought to be insect pollinated. Typically flowers between November and March, with seed pods produced three to four months later (Forster 1996). Local observations suggest that pods are produced infrequently. Seed is wind dispersed.

- Capable of regenerating from rootstock comprising a fragile string of interconnected water-storage tubers.
- Commonly inhabits open eucalypt forests on hillslopes and ridges; also grows in rainforest and rainforest margins. Soils are generally well drained, shallow and derived from sandstone or acid volcanic rocks.



Plate 2. Fragile string of connected tubers (left); mature seed in pod (right). Photos: Jennifer Coleman

Site selection

All documented locations of *L. coronata* within a 10 km radius of the impacted occurrences were assessed for their potential suitability as recipient sites. Factors considered included:

- Supporting habitat attributes (landform, soil type and vegetation), patch size and degree of disturbance.
- Confirmed presence of *L. coronata*.
- Connectivity to larger intact parcels of land.
- Potential impacts to the existing occurrence and supporting habitat from translocation.
- Security of land tenure and existing land use.
- Site constraints (access and/or terrain).

The chosen site was considered the best on offer with supporting habitat closely matching that of the impact sites. The site also supported a healthy occurrence of *L. coronata* and was readily accessible for translocation activities. The site was also owned by TMR and will be managed in perpetuity for the purposes of conservation.

Translocation proposal

A translocation plan (GHD 2018) was submitted to DES for approval as part of a protected plant clearing permit application (Permit Number WA0014813v3). The purpose of the plan was to document the roles, responsibilities and actions to be taken to maximise the long-term success of the translocation program. A technical memo was also provided to prospective translocation contractors with additional guidance on translocation works and potential constraints.

Pre-translocation preparation, design, implementation and ongoing maintenance

A total of 1603 plants were translocated from October 2019 to July 2020. On-ground translocation works were undertaken by NDLG staff together with trainees employed through the TMR Indigenous Traineeship program. Key steps undertaken are outlined in the following subsections.

Pre-works survey

Given the inconspicuous nature of the species, the first step was to mark out all plants at the impact sites so that plants were not missed during salvage operations. When a plant was found, a blue flag with a metal identification tag was placed at its base and the location recorded using the Avenza mapping program.

Prepare recipient site

The recipient site was divided into zones, with a separate zone allocated to each of the respective salvage sites. Existing *L. coronata* plants were marked with yellow irrigation markers to differentiate them from translocated plants and protect them from trampling during planting operations. Weed control was undertaken to suppress invasive weeds, principally *Passiflora suberosa* and *Lantana camara*.

Salvage operations

Salvage operations were largely conducted between October 2019 and February 2020. Plants were excavated using hand tools and the rootstock gently teased out of the ground. They were then wrapped in moist hessian, placed in a styrofoam box and kept in the shade until being replanted later that day. Particular care was taken to not damage the uppermost tuber (primary tuber) as it contains the growing point of the plant. Loose tubers that were disconnected from the primary tuber (secondary tubers) were collected and planted at the recipient site in a separately allocated area. Plant details (unique identification number, salvage site, health and number of tubers) were recorded and tracked with each plant. Seed capsules, although infrequent, were also collected when sighted and sent to a specialised native nursery for propagation.

Planting operations

The salvaged string of tubers was carefully placed in a planting hole, with the primary tuber and growing point uppermost. Each hole was then backfilled with excavated soil. Plants were then watered and a fungicide drench (Banrot 400WP) applied using a watering can. A flag was inserted next to each plant and labelled with the unique identification number assigned at the salvage site. Each plant location was recorded with a differential global positioning system (DGPS) and a site layout plan prepared to assist with monitoring activities.



Plate 3. Excavating plants from the salvage site (left); Transporting plants in moist hessian layers (right). Photos: Jennifer Coleman

Maintenance

Maintenance was undertaken every two weeks for the first three months following planting. Activities included ongoing weed control, checking soil moisture and looking for any visible signs of stress, disease or insect attack. Watering was undertaken from December to February. Broad spectrum insecticide treatments were applied when required.

Monitoring and evaluation

Three permanent monitoring quadrats (25×5 m) were established at the recipient site and monitoring has been undertaken twice a year (May and November) since commencing in 2020. Parameters assessed include plant survival, plant health, reproductive output and impacts from insects, fauna and erosion. The three quadrats capture approximately 14% of translocated plants, which was considered to provide an adequate sample size for monitoring purposes.

Subsequent actions

- Additional plants were salvaged and replanted following a post-translocation survey of the impact sites, approximately one month following the initial translocation activities.
- Additional maintenance activities such as watering and weed control have continued as required. Seeds continue to be collected when sighted during maintenance activities.
- Monitoring activities are continuing bi-annually, with results communicated to DES.
- Supplementary planting of up to 800 plants will be conducted over the spring/summer period using nursery stock developed from cuttings and seed to compensate for losses.

Outcomes

- Less than half (44.1%) of the translocated plants were alive at the time of the last monitoring event (November 2021) (Figure 1).
- A review of climatic data for Gympie (Bureau of Meteorology 2021) indicates that the planting period was characterised by hot and dry conditions, with November 2019 being the hottest month on record since 1979. Such conditions may have contributed in part to the survival rates recorded. The condition of the tubers was also reflective of the prolonged dry weather, with many tubers appearing soft, deflated and brownish in colour. By comparison, tubers excavated during wetter conditions appeared firm and white.
- The majority of plants (81.6%) that possessed leaves or stems during the first monitoring event have continued to survive.
- Of those plants alive, most (81.9%) were in good health and showed minimal signs of stress.



Plate 4. Healthy translocated plants 18 months after planting. Photos: Carly Sugars

- The presence of secondary tubers at the time of translocation had only a minor influence on survival, with 52.9% of those plants possessing both primary and secondary tubers alive at the time of monitoring compared to 47.1% of plants possessing primary tubers only.
- Tuber health does not appear to substantially impact survival over time, with a similar proportion of plants alive after two years, regardless of whether tubers were in good or poor health at the time of planting.
- Most (92%) of the plants showed low levels of insect predation.
- No plants were observed flowering or fruiting.
- No plants appeared to be impacted by fauna or erosion and weeds levels were generally low (<5% cover) across the site.
- None of the loose secondary tubers sprouted during the monitoring period. Excavations indicate they have perished.

What we learned

- The number of plants to be translocated was substantially underestimated. It appears that ground disturbance and follow-up rainfall following the pre-works survey may have initiated resprouting of dormant tubers. Sites should be rechecked one month after completing salvage works.

- Tubers are typically found within the top 30 cm of soil and can grow horizontally or vertically. Excavating the entire string of tubers is time consuming and is unlikely to assist survival in a material way.
- Translocation should be avoided in hot, dry conditions where possible.
- Plants have a climbing habit and should be planted next to small shrubs or branches which they can use for scaffolding.
- Collection and planting of loose secondary tubers is not warranted.
- Further investigation is required to determine causes of plant mortality, particularly those plants that failed to resprout or grow in the first growing season after translocation. Supplementary planting should be allowed for to compensate for potential losses.

References

Bureau of Meteorology (2021). *Climate Data Online*. Australian Government. Available at: <http://www.bom.gov.au/climate/data/index.shtml> (Accessed: 16 November 2021)

Forster, P.I. (1996). Asclepiadaceae. In: *Flora of Australia*. Volume 28, pp. 197–283. Melbourne: CSIRO.

GHD (2016). *Bruce Highway Cooroy to Curra (Section D: Woondum to Curra) Detailed Design Job No. 232/10A/7, Invitation No. WBYD-1335 Translocation Management Plan - Marsdenia coronata*. Unpublished report prepared for the Department of Transport and Main Roads.

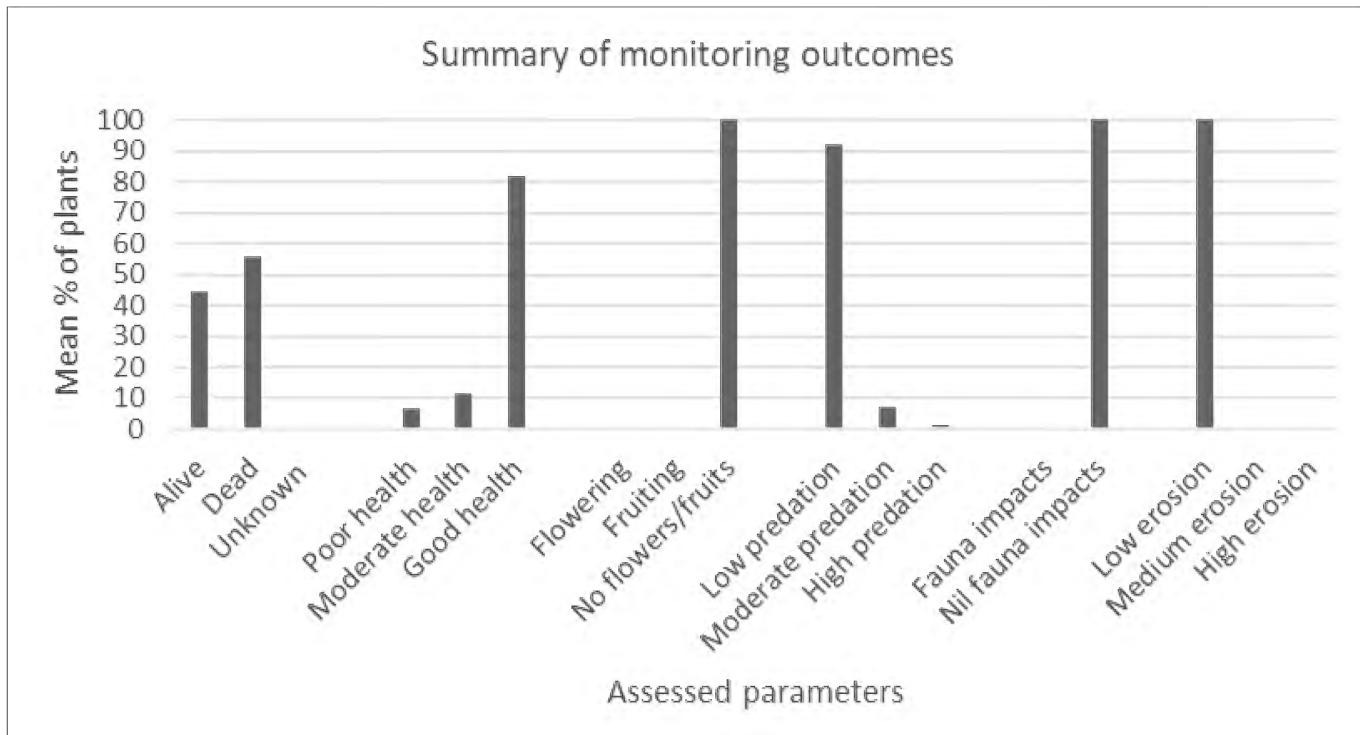


Figure 1. Event 4 monitoring results for each measured parameter.

Designing biodiversity field guides in the Central Tablelands

THOMAS LEE¹, CHRIS GAUL² AND COREY TATZ³

¹School of Design, University of Technology Sydney, NSW 2007

²Parallel Line Design.

³Central Tablelands Landcare, Environmental Learning Facility, Orange, NSW 2800

Biodiversity: ‘a feel-bad word for the new millennium’

“Biodiversity is the feel-bad word for the new millennium” (Bowker 2005)—Geoffroy Bowker’s pithy remark published shortly after we ticked over into the ‘00s has lost none of its pertinence today. Biodiversity emerged as a concept in the context of discussions about how to stop it diminishing and the word still conjures a sense of loss as much as abundance: *we’re losing biodiversity, we might lose biodiversity, we once had more, we must conserve...*

Bowker is a Professor of Informatics at the University of California, Irvine, and brought a unique perspective to understanding human classificatory systems, among which systems for classifying the natural world play a crucial role. Among the features of Bowker’s research which make it unique is his twin concern with information and values. The overarching insight of his many books and articles was that the information and values go together in specific and complex ways in different fields of human endeavour, even if washing out one ‘noise’ (values or information) from the other ‘signal’ (information or values) often aids in communicating a message.

The notion of a ‘biodiversity guide’ or ‘flora and fauna guide’ perhaps doesn’t immediately seem like an antidote to the bad feelings that Bowker identified as bound up with the word biodiversity. ‘Biodiversity guide’ suggests something that is useful to people preoccupied with biodiversity, and how many people say to themselves “hmmm, I’m keen to go looking for some biodiversity today.” Not many. For this reason, it rightly tends to be plants, animals, and regions that make up the bulk of guide focal areas, including ‘Wollongong’s Native Trees’, ‘A Guide to the Birdlife of Illawarra’ and ‘Photographic Guide to the Native plants of the Australian Capital Territory’ to name a few nearest to hand, and giving some insight into the various niches through which my trails are marked.

Design as a means to understand the weave of values and information

But what about people—guides for specific audiences, with specific goals, whose lives are made up of a range of specific practices?

This is where design can play a role: in putting people or a community of people at the centre of a guidebook. ‘People’ or ‘communities’ can be as generic or specific, as simple or as complex, as our training and intuitions allow. A community can be ‘Wollongong’, a person can be a ‘Wollongongian’ (though not very often if word usage is anything to go by!), or they can be ‘surfer’, a ‘birdwatcher’ or a ‘bushwalker’...and from here the only limitation is time and imagination.

But this only really scratches the surface, because getting inside a person’s mind and understanding what they do in the world and how they feel through it will give a completely different perspective to what is described by sets of attributes like: *lives in Wollongong, likes walking, likes trees or birds*. Ideally, design arrives at a particularly generous understanding of the weave of human interiority and practical action such that things, like guidebooks, might be made to best serve them both.

Biodiversity conservation on private land

In Australia, it is widely accepted that the management of private freehold land is crucial to maintaining environmental health, whether through reducing soil erosion and soil quality, water flows, managing the run-off of chemical and animal contaminants, managing pests, and managing the quantity and quality of life in a given area.

Almost half (48%) of all of Australia’s threatened species distributions occur on private freehold land (Kearney *et al.* 2022). Understanding what occurs on that land: who manages it, what their needs are, and how to help support those needs, is crucial if ambitious goals regarding biodiversity conservation are going to be met.

Our research is in the Central Tablelands, an area of approximately 31,365km² in central New South Wales (Central Tablelands LLS 2021). Most of that land is used for, and shaped by, agricultural production systems. Much of this area is for grazing, but also smaller areas of broadacre crops and horticultural enterprises (Central Tablelands Local Land Service 2021). Therefore, if you are going to design a biodiversity guide for someone in the Central Tablelands, you could do worse than designing it for a grazier.

A gateway to the great grazing grasses in Central Tablelands

At a design workshop in Bathurst, research participants confirmed that focusing on graziers was a good idea if our research was intending to help support biodiversity conservation in the region. A grazier is literally defined as 'a grass person'. A grass person with grass-eating animals to be more exact. Therefore, we thought to try and design a guide that spoke to the values and practices of graziers in the Central Tablelands region: a native grasses guide for graziers.

We also learned from the research participants that one of the key problems with guidebooks in their experience was the sense of an insurmountable 'wall of knowledge'. Many guidebooks focused on species and places aim to approach comprehensiveness, even within a bounded domain of knowledge. Perhaps not *all* the trees or birds, but a good crack. Even fifty things of a specific type can seem a little dizzying, particularly when the distinctions between those things aren't conspicuous to non-expert audiences.

By contrast, in order to help address 'the wall of knowledge' we focused on curation not comprehensiveness: a purposeful selection of grasses, intended to appeal to a particular audience and for that knowledge to act as a 'gateway' or 'stepping stone' to engage users on a pathway to accumulating more knowledge should they choose. There are excellent freely available guides to grasses in the Central Tablelands that interested graziers can access should they desire.

Local gems

The idea of reframing a threatened species as a 'local gem' was another design concept that emerged while engaging with residents in the Central Tablelands region. Like the bad feelings Bowker ascribes to 'biodiversity', the idea and sense of threatened species doesn't exactly speak the language of human aspiration. Local gem, by contrast, evokes a sense of specialness that have the potential to connect with feelings of local pride in landholders who might have one of these things just over the hill or under a log.

Then there is the strategic question of the extent to which threatened species are the right focus for the benefit of the threatened species themselves. In other words, are there other species or sets of species with complementary ecological needs (e.g. require tree hollows for habitat) that are both more likely to engage the people managing land? What qualities are likely to engage landholders in this sense? And what selection of species might offer the benefits of the greatest quantity and quality to a given bioregion or subregion or particular ecological community?

It might appear odd to take a strategic, human-centred approach about something as seemingly valueless and objective as the sorting and ranking of species based on vulnerability. However, the point Bowker (2005) makes is

Curated List of Species

[Introduction text here.]



Barbed Wire Grass

Cymbopogon refractus



Box Grass / Knottybutt

Paspalidium constrictum

Figure 1. Sample image of draft grasses guide. Visual design by Chris Gaul.

that species classification is already in part value-laden and contingent. This is not to say anything goes, but simply to point out that different abstractions have different purposes and what humans choose to focus on in this regard has consequences for where we devote our energies collectively. It then makes sense to keep an open mind and consider a range of abstractions, suited to a range of values, if both humans and species, in all their diversity, are concerned.

It is not like ecologists do not already think about this stuff either. The problem framing is just a broader invitation for disciplines that might not typically be thought of as ecological in their orientation.

Conclusion

These are just a couple of yet to be tested, sketched out ideas that hopefully appear informed by a legible, explanatory rationale regarding the interaction between people, places and the different living things that inhabit places. The broader point is that design has a role to play not just in presenting knowledge about conservation to different people, but also in understanding why that knowledge is selected and sorted in the particular way that it is, and to explore whether there is scope for thinking more sensitively, strategically and more inclusively about what knowledge released into an environment aims to achieve.

References

Bowker, G. (2005). Time, money, and biodiversity. In A. Ong and S. Collier (eds.) *Global Assemblages: Technology, Politics and Ethics as Anthropological Problems*. Blackwell Publishing, Malden, MA.

Central Tablelands Local Land Services (2021). *Local Strategic Plan 2021-2026 supporting document*. Available at: https://www.lls.nsw.gov.au/_data/assets/pdf_file/0009/1362717/Central-Tablelands-Local-Strategic-Plan-2021-2026-supporting-document.pdf

Kearney, S.G., Carwardine, J., Reside, A.E., Adams, V.M., Nelson, R., Coggan, A., ... and Watson, J.E. (2022). Saving species beyond the protected area fence: Threats must be managed across multiple land tenure types to secure Australia's endangered species. *Conservation Science and Practice*, 4(3), e617.

News from the ASBP

Establishing a new spore bank for Victoria's fern and lycophyte species

DANIEL J OHLSEN^{*1} AND REBECCA E MILLER¹

¹Royal Botanic Gardens Victoria, South Yarra, Victoria 3141, Australia.

*Email: Daniel.Ohlsen@rbg.vic.gov.au

Victoria has 123 native fern and lycophyte (a group of spore-bearing vascular plants) species, around a quarter of the Australian total. Among these species are one Victorian endemic and 46 species listed as Endangered or Critically Endangered in Victoria under the Flora and Fauna Guarantee (FFG) Act (1998). Despite this large proportion of threatened fern and lycophyte species, *ex-situ* conservation of this plant group has lagged behind seed plants in Victoria, which for the last 17 years has included the Victorian Conservation Seedbank based at the Royal Botanic Gardens Victoria (RBGV). Owing to their diversity in wet forests, ferns and lycophytes are expected to be vulnerable to drought and changes in fire frequency and intensity. In the 2019–2020 black summer bushfires, 33% of cool temperate rainforest in East Gippsland was burnt (East Gippsland Recovery Committee, 2020) and 78% of Victoria's warm temperate rainforest was burnt, with 70–95% of the habitat of at least six FFG listed fern taxa impacted (DELWP 2020). To address these shortcomings the RGV, with the support of Bushfire Biodiversity Response and Recovery funding from the Victorian Department of Environment, Land, Water and Planning (DELWP), has begun development of a spore bank for Victorian fern and lycophyte species. Australian Seed Bank Partners across Australia have undertaken spore banking for various species as part of their broader germplasm conservation programs; however, the spore bank at the RGV is the first dedicated spore bank to be established in Australia and will also safe-guard future collections from interstate partners.

Initial target species for the RGV fern and lycophyte spore bank included any species, common or rare, that: 1) a reasonable quantity of spores could be obtained from that would allow sorting into parcels for storage, 2) would be able to be germinated without special treatment, and 3) could be maintained in cultivation under typical nursery conditions. This resulted in an initial target of 72 species and excludes some species for which mycorrhizal associations are suspected to be important for germination and subsequent growth and maintenance (e.g. Gleicheniaceae and Schizaeaceae), and smaller species with a high dependence on sheltered humid conditions (e.g. Hymenophyllaceae). For each species, populations throughout their Victorian distributions are being sampled. For some species prior knowledge of the distribution of genetic variation in these species is

being used as a basis for where to sample to maximise representation of their gene pool (e.g. Ohlsen *et al.* 2020).

To collect the spores, fronds of each species that have sori with sporangia that have not yet dehisced to release spores are first pressed between sheets of newspaper and cardboard sheets in a lattice plant press as is typically done to produce an herbarium specimen. The colour of the sori can provide a rough guide whether the sporangia are still intact with their spores. However, colour of sori before sporangial dehiscence varies between species, with some black, some brown and others a brown-red, and so some trial and error is required to become familiar with which fronds are best chosen to yield spores (Figure 1). Several fronds from several plants are usually required to provide sufficient spores. As the frond dries the sporangia dehisce and drop the spores onto the newspaper. Once fully dried the fronds are removed from the newspaper leaving the spores, as well as sporangia and other unwanted debris such as dirt, fern scales and hairs behind (Figure 1). The newspaper is folded at the edges to form a seal and then flicked to knock all the contents into the seam and then opened and poured through a sieve with 75 µm apertures (Figure 1). Most fern spores are between 25 and 55 µm long, which allows them to fall through the sieve apertures, while the unwanted debris that could potentially contaminate the sample is left behind in the sieve.

In many instances there have been no fronds with intact sporangia on target species when fieldwork has been conducted. In these instances entire plants have been collected and grown on at RGV (Figure 2) with the intention of harvesting the fronds when they eventually produce sporangia that are ready to dehisce with mature spores. This process of "orcharding" will probably prove highly beneficial to any fern spore banking project. The phenology of when ferns shed spores is poorly documented and so organising fieldwork to coincide with likely times when spores will be shed is largely based on guess work and may not coincide with optimal times for collection. Having a spore orchard to collect from allows regular inspection to collect at an ideal time rather than repeatedly travelling long distances on potentially unfruitful collecting trips (Figure 3). It can also be used to top up existing quantities of spores in storage and support research into spore germination and the development of protocols to maximise successful long-term storage.



Figure 1. (a) Underside of a *Pneumatopteris pennigera* frond showing sori that have intact sporangia ready to dehisce and release spores; (b) Pressed and dried *Blechnum chambersii* showing the spore print left behind on the newspaper; (c) Underside of *Adiantum formosum* showing sori around frond edges; (d) spores of *Dicksonia antarctica* sieved through the 75 µm sieve. Photos: Daniel Ohlsen, Kai Qu (b)

To date 38 species and 49 populations are being grown for orcharding for the RBGV spore bank, including the threatened species *Adiantum formosum* (Figure 2), *Asplenium aethiopicum*, *A. appendiculatum*, *A. hookerianum*, *A. trichomanes* subsp. *trichomanes*, *A. trichomanes* subsp. *quadrivalens*, *Blechnum deltoides*, *Cyathea cunninghamii*, *Cyclosorus interruptus*, *Cystopteris tasmanica*, *Davallia solida*, *Lastreopsis hispida*, *Pneumatopteris pennigera* and *Pteris epaleata*. This has demonstrated that Victorian ferns are generally easy to transplant and most grow readily under shade with regular moisture in a standard potting mix. For some small species (fronds less than around 10 cm long) in the live collection (e.g. *Cystopteris tasmanica*), fronds that have sporangia ready to dehisce spores have been harvested and the spore yield has been so low that the

spores have been difficult to collect and near impossible to sort into parcels for storage. Based on this difficulty, *ex-situ* conservation of such species seems better suited to relying on maintaining living collections given the ease by which these species have grown in cultivation.

For the purposes of *ex-situ* conservation, ferns qualify as exceptional species – those with propagules that demonstrate poor long-term viability when dried and frozen at -18°C or -20°C, the conditions routinely used for long-term storage of seeds (Philpott *et al.* 2022). Past studies have shown that drying fern spores to a water content of around 5–6 % and then storing at -80°C to -196°C seems optimal for a broad range of species, with notable improvements in viability over time compared to storing at -18°C or -20°C for some species (Pence 2000; Li *et al.* 2010; Ballesteros *et al.* 2011, 2012; Li & Shi 2014; Jang

& Lee 2021). For the RBGV spore bank, freshly collected spores are left to dry for a week inside the herbarium at room temperature. Drying in a typical air-conditioned room for a week has been shown to produce a 5–6% water content in spores (Jang & Lee 2021). The spores are then packaged into roughly 5 × 10 mm tinfoil packages, which provides an ideal quantity of spores for a germination trial that can be taken out without removing and completely thawing the entire spore mass for that collection (Figure 4). This is beneficial as spore viability has been shown to be sensitive to repeated freeze-thaw cycles (Ballesteros *et al.* 2012). The packages are then placed into sealable tubes and stored in an electric freezer that maintains a temperature of -150°C (Figure 4).

This RBGV spore bank now contains 14 species and 22 populations of Victorian ferns with spores in the freezer including single populations of the threatened species *Adiantum formosum* and *Pteris epaleata*, and three populations of the endangered *Lastreopsis hispida*. The 2019–2020 bushfires impacted 95% of the modelled habitat of *A. formosum*, and initial post-fire surveys did not locate the species (DELWP 2022), with an unburnt population later identified and sampled by the RBGV. In addition to spores now in storage at RBGV Melbourne, *A. formosum* is also held within the *ex-situ* living collection at RBGV Cranbourne (Figure 2). Another notable recent addition to the spore bank was a population of the elusive *Anogramma leptophylla* (Figure 5).



(a)



(b)

Figure 2. (a) A portion of the fern spore orchard in the RBGV Melbourne nursery; (b) *Adiantum formosum* from one population found unburned after the 2019–20 bushfires, growing at the RBGV Cranbourne. Photos: Daniel Ohlsen, Kai Qu



Figure 3. (left to right) Dr Daniel Ohlsen in the field at Bryce Gorge, Alpine National Park, and removing fertile fronds from the living collection of *Asplenium trichomanes* in the RBGV Melbourne nursery. Photos: Adele Neale, Tim Uebergang

This species is rare, small and easily overlooked, and has an annual sporophyte that emerges in the cooler and wetter months from a perennial gametophyte (Bostock 1998). All these attributes contribute to this species seldom being seen, and in Victoria the last collections prior to this year were made in 2003 and 1987. Unlike other small species, pressed fronds yielded enough spores to fill two 5 × 10 mm tinfoil packages, resulting in a valuable contribution to the spore bank. The spore bank now also includes spore samples from two species obtained from orcharding, namely *Adiantum formosum* and *Pellaea falcata*.

The RBGV spore bank is still in its infancy, with the first spore collections banked in July 2022. With many target species still to collect, the upcoming year is likely to be



Figure 4. Spores in small foil parcels in microcentrifuge tubes are boxed and placed in the -150°C electric freezer for long-term storage of spores at RBGV. Photos: Daniel Ohlsen, Rebecca Miller

a year focused on accumulating as many new spore collections as possible until initial targets are met. No tests of spore viability after freezing have yet been conducted and how and at what intervals this is to be done have not been determined; however, some trials into how to germinate a range of spores have been conducted. Orthodox methods of spreading of spores on agar plates and growing in a growth cabinet have been trialled with some success. An alternative method of sowing spores on small *Dicksonia antarctica* trunk segments and maintaining under misting in a terrarium appears to support more rapid germination of spores and sporophyte development without issues of mould contamination (Figure 5).

In future years there are plans to extend the spore bank beyond the initial fern species to potentially include species that likely form mycorrhizal associations (Rimington *et al.* 2015). Mycorrhizal fungi are already being stored following the methods established by Reiter *et al.* (2021) as part of the RBGV orchid conservation program with the support of the same DELWP funding. Currently, 118 fungal cultures have been stored in triplicate. Research on fern mycorrhizal associations will involve working with RBGV mycologist Dr Camille Truong to identify potential fungal root symbionts using microscopy, culturing and eDNA analyses, with the aim to investigate the potential importance of these symbioses for fern propagation and growth.

Editor's note: You can learn more about spore conservation in Chapter 13 of ANPC's Germplasm Guidelines, YouTube Channel (<https://www.youtube.com/@AnpcAsnAu>) and previous APC issues.

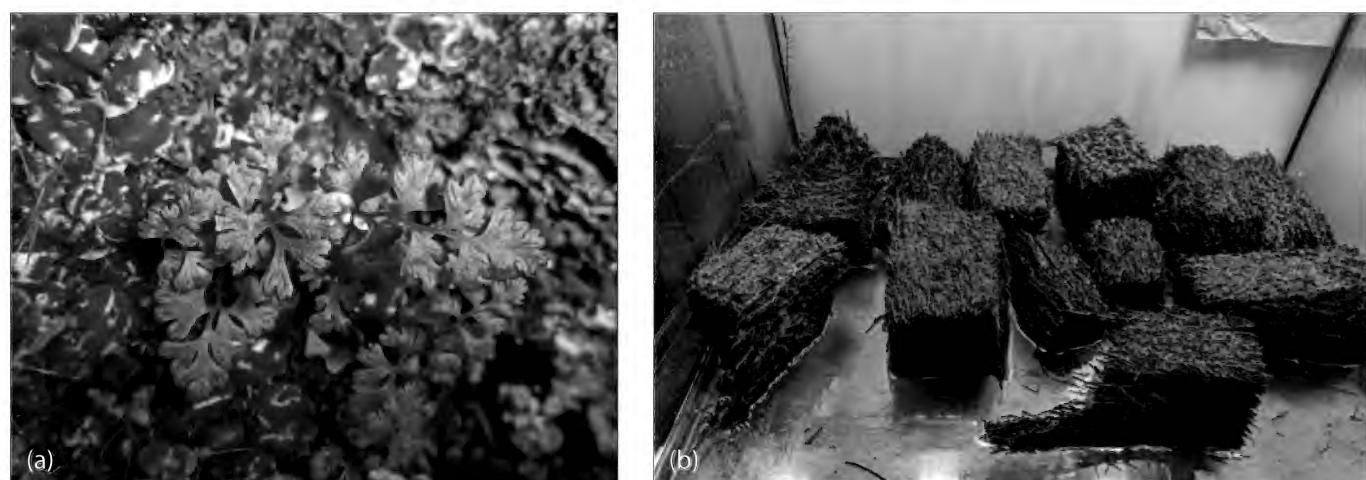


Figure 5. (a) A plant of *Anogramma leptophylla* at Byaduk Caves, southwest Victoria, recently harvested for spores; (b) Spore germination trial whereby spores are sown onto small segments of *Dicksonia antarctica* trunk and placed in a sealed terrarium kept at consistently high humidity. Photos: Kai Qu, Daniel Ohlsen

References

Ballesteros, D., Estrelles, E., Walters, C. and Ibars, A.M. (2011). Effects of storage temperature on green spore longevity for the ferns *Equisetum ramosissimum* and *Osmunda regalis*. *Cryo Letters* 32: 89–98.

Ballesteros, D., Estrelles, E., Walters, C. and Ibars, A.M. (2012). Effects of temperature and desiccation on ex situ conservation of nongreen fern spores. *American Journal of Botany* 99: 721–729.

Bostock, P.D. (1998). *Anogramma*. In 'Flora of Australia. Ferns, Gymnosperms and Allied Groups. Vol. 48'. (Ed. P.M. McCarthy) pp. 250–251. (ABRS: Canberra, ACT, Australia; and CSIRO: Melbourne, Vic., Australia)

Department of Environment, Land, Water and Planning (DELWP) (2020) *Victoria's bushfire emergency: biodiversity response and recovery, Version 2*. Melbourne, Victoria. August 2020. Available here: https://www.wildlife.vic.gov.au/__data/assets/pdf_file/0030/484743/Victorias-bushfire-emergency-Biodiversity-response-and-recovery-Version-2-1.pdf

Department of Environment, Land, Water and Planning (DELWP) (2022) *Biodiversity response and recovery supplementary report: bushfire impacts on species in Victoria*. Melbourne, Victoria. August 2022. Available here: https://www.wildlife.vic.gov.au/__data/assets/pdf_file/0035/589805/Biodiversity-Bushfire-Response_Supplementary-report-on-bushfire-impacts-on-species-in-Victoria-.pdf

East Gippsland Recovery Committee (2020). *East Gippsland Fires 2019–20 Bushfire Recovery Plan – Summary of Impacts*. East Gippsland Shire Council. Available here: https://assets-global.website-files.com/5f10ce18aa01d050c26b7c5e/5ff392e1a0030346864a64e7_summary_of_impacts.pdf

Jang, B.K. and Lee, C.H. (2021). Effect of temperature and relative humidity on the viability and longevity of eastern bracken (*Pteridium aquilinum* var. *latiusculum*) spores for long-term storage. *Scientia Horticulturae* 288: 110362.

Li, Y. and Shi, L. (2014). Effect of desiccation level and storage temperature on green spore viability of *Osmunda japonica*. *Cryobiology* 68: 446–450.

Li, Y., Zhang, Y.L., Jiang, C.D., Wang, T., Wang, Q. and Shi, L. (2010). Effects of storage temperature on spore viability and early gametophyte development of three vulnerable species of *Alsophila* (Cyatheaceae). *Australian Journal of Botany* 58: 89–96.

Ohlsen, D.J., Shepherd, L.D., Perrie, L.R., Brownsey, P.J. and Bayly, M.J. (2020). Genetic variation and phylogeography of the Australian and New Zealand fern *Asplenium flabellifolium* (Aspleniaceae). *Australian Systematic Botany* 33: 412–426.

Pence, V.C. (2000). Survival of chlorophyllous and non-chlorophyllous fern spores through exposure to liquid nitrogen. *American Fern Journal* 90: 119–126.

Philpott, M., Pence, V.C. and Coffey, E.E.D. (2022). Building capacity in the conservation of exceptional plant species. *Applications in Plant Sciences* 10: e11498.

Reiter, N., Dimon, R., Freestone, M., Davis, B., Newby, Z-J., Swarts, N. and Sommerville, K. (2021). Chapter 12: Isolation, propagation and storage of orchid mycorrhiza and legume rhizobia. In: *Plant Germplasm Conservation in Australia*. Australian Network for Plant Conservation, Canberra.

Rimington, W.R., Pressel, S., Duckett, J.G. and Bidartondo, M.I. (2015). Fungal associations of basal vascular plants: Reopening a closed book? *New Phytologist* 205: 1394–1398

Plant Germplasm Conservation in Australia.

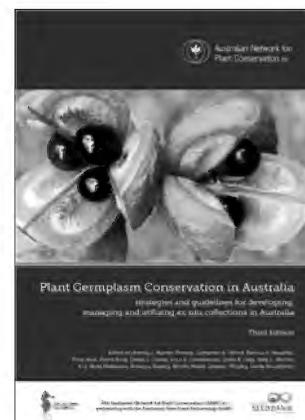
Strategies and guidelines for developing, managing and utilising ex situ collections.

Fully revised third edition 2021. Edited by Amelia J. Martyn Yenson and the Germplasm Guidelines steering committee.

New chapters on genetics, identifying non-orthodox species, the role of the nursery, and ex situ conservation of orchids, carnivorous and parasitic plants, spores and pollen.

Fifty case studies on all aspects of germplasm conservation, from planning and partnerships to utilisation of collections.

Free download and hard copies available for purchase
www.anpc.asn.au/plant-germplasm/



ANPC Member Profile

Russell Larke

What is your current position?

Team Leader of Horticulture, Royal Botanic Gardens Victoria (RBGV) (Cranbourne).

I am moving into a fixed-term secondment as the Bushfire Recovery Living Collections Curator in January 2023.

What projects are you working on now?

The Bushfire Recovery Project in East Gippsland has been the primary conservation focus of the RGV since the 2019-20 fires throughout south-eastern Australia. This has been a collaboration between RGV staff from the Victorian conservation seedbank, the conservation genetics team and the RGV Cranbourne horticulture team. I will be transitioning into the role as the Bushfire Living Collections Curator in the next few months to continue this work, with a focus on collaborating with the many partners (DEWLP, Moogji La Trobe University, Parks Victoria, ENVITE, Friends of Mallacoota, Mallacoota Endemic Garden, East Gippsland CMA) that are contributing to recovery works throughout the East Gippsland region.

The RGV horticulture team and conservation genetics team are currently involved in a Flood Recovery Project examining the population genetics and demographics of the critically endangered *Eucalyptus ornans*.

We're also involved in multiple single species projects involving the establishment of genetically and geographically representative *ex situ* living collections including *Xerochrysum palustre*, *Grevillea pachylostyla*, and *Grevillea jephcottii*.

An exciting new collaboration is the Raising Rarity Project – a project focused on building the profile of Victoria's rare and threatened species. The RGV team including Dr Meg Hirst, Matthew Henderson, Mandy Thomson and myself are looking to assess the horticultural potential of rare species and bring them into cultivation so people can purchase these species and contribute to the ongoing conservation work at the RGV. We are also currently trialling a pilot program where we involve schools in the growing and seed collection of rare and threatened plant species.



Russell Larke at a community information day on the Avon River identifying the critically endangered *Eucalyptus ornans*.
Photo: Kaishan Qu

How did you end up working in plant conservation?

I have always had a love of nature and knew at a young age I wanted to be involved in conservation. I have come from a horticultural / landscaping background, however, have always felt the urge to get involved in plant conservation. I worked as a Senior Ranger at a local shire and subsequently moved into private natural resource management. I then studied conservation land management, horticulture and science and was lucky enough to get the job of Team Leader of Horticulture at RGV that has allowed me to become increasingly involved in plant conservation.

What is your favourite plant and why?

That's like trying to choose between your children!

At present it would be *Grevillea gariwerdensis*, a beautiful narrow-leaved species endemic to Gariwerd (Grampians) that has been in decline over the last 25 years. This species is at real risk of extinction, and currently listed as data deficient under the Flora and Fauna Guarantee Act 1988. I am hoping to get this species onto a recovery plan and secure what is left of these populations both *in situ* and *ex situ* to ensure the ongoing survival of this species.

This year, 2023, The RBGV Cranbourne Team, along with Neil Marriot, discovered multiple seedlings at the type location (there is a single mature plant at this site). This is the first recruitment event seen at this site in over 25 years, probably due to the unseasonal rainfall over the last few months. We have been to this site multiple times over the years and to see this species on the brink making a comeback was pure joy for all of us! It reinforces the value of passionate people not giving up on a species as there are still good news stories out there and it inspires me to continue to pursue these projects as there is still so much work to be done out there.

Why do you think the ANPC network is important and what do you see are our priorities?

I am a big believer that conservation cannot be done in isolation and the work that the ANPC does (e.g., Germplasm Guidelines, Translocation Guidelines) provides access to best practice techniques for the entire spectrum of people and organisations involved in conservation to better understand and contribute meaningfully to plant conservation. To have such comprehensive resources available as free downloads is an amazing resource and I think it really empowers people (who may not have known where to start in some cases) to become involved in conservation.

For us at the RBGV, the guidelines have promoted multiple discussions around how we can improve our practices from survey, collection, building genetically representative *ex situ* populations, conserving exceptional species, streamlining record keeping and how to better prioritise conservation targets. This highlights the value of these resources across the whole spectrum of organisations who are already involved in conservation (e.g., Botanic Gardens) to those people or organisations looking to become involved (e.g. private landholders)

In addition, the case studies provide practical, easy to understand representations of conservation in action, which both highlight best practice and how multiple partners can (and should) come together. I think these not only highlight the value of collaboration but also can be used as examples to inspire anyone who is looking to become involved in conservation at any level.

I think a key target for the ANPC is to continue to reach out to the regions to ensure that everyone who is or looking to become involved in plant conservation are aware of the resources available to them to ensure best practice is maintained.

I also think there may be a role for the ANPC, perhaps in collaboration with BGANZ, to play in exploring how to create a standardised / centralised data collection system 'hub' or master list which can capture the breadth of plant conservation works being undertaken by multiple people and organisations across Australia. This could include centralised living collections information, survey information, translocation / reintroduction work, seed storage information, propagation information, genetic information that partners could both contribute to, or search for information (e.g., search for genotypes of a particular species in other *ex situ* collections). This is obviously a huge task however, access to a centralised data collection system for multiple partners would promote the sharing and use of information, improved collaboration, upskilling of partners in data collection, and capture the breadth of works being undertaken across the country.



Grevillea gariwerdensis (Gariwerd Grevillea).

Photo: Russell Larke

Book review

Guide to Native Orchids of NSW and ACT

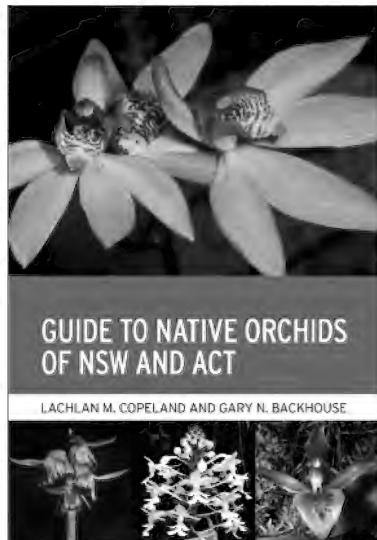
LACHLAN COPELAND, GARY BACKHOUSE

Paperback | January 2022 | \$ 49.99 | ISBN: 9781486313686 | 456 pages | 215 x 148 mm |

Publisher: CSIRO Publishing | Colour photographs, Maps

Several of my botanically minded friends have this on their Christmas lists (I hope by the time this review is published that their Christmas wishes have come true!). This comprehensive offering from Lachlan Copeland and Gary Backhouse includes 582 orchid species and is a valuable addition to the libraries of those with an interest in NSW and ACT orchids specifically, or the diversity of south-eastern Australia's flora in general. The book is well presented – the perfect size for a field guide – and the photographs, both beautiful and informative, are a highlight. Descriptions of orchid taxa are illustrative and succinct, focussing on the details which assist in species identification in the field. Distribution maps provided for every species help with this too.

In the Readers Notes, Copeland and Backhouse do not shy away from discussing the challenge of some orchid genera having multiple names in current use. For each taxon, they have had to make a decision about the headline name to use, with the other name(s) listed as synonyms (e.g., *Bulbophyllum* over *Adelopetalum*, *Corunastylis* over *Genoplesium*) and some will disagree with these choices. With the insight of those with deep knowledge of the field, the authors note that they "hope this publication will stimulate further interest in resolving some of the outstanding issues around orchid taxonomy..." – something we can all agree with. The book is organised in alphabetical order by genus, and within each genus, morphological taxa are grouped to enable comparison and identification. While some might find this non-alphabetical arrangement difficult, I like it because it suits my approach to identification ("this looks like a ..."). This arrangement also means that many of the segregate genera not recognised by the headline names are largely grouped together (e.g., *Oligochaetochilus*, *Plumatichilos*, *Speculantha* et al. within *Pterostylis*).



Enthusiasts will also appreciate that the book includes taxa described as 'sp. aff.' where the authors have it deemed necessary, to account for taxa that to fall outside current taxonomic boundaries – this allows for some recognition of these plants which are a 'bit different', while stopping short of describing them as new species. Presenting them in this way encourages further information gathering, learning and (we assume), if the taxon stands up to scrutiny, eventually it will be formally published.

Lastly, I enjoyed how the authors share their knowledge in the 'notes' section accompanying each taxon, highlighting similar species, which

may pose a misidentification risk, and key points to aid in identification, including relative rarity and habitat, as well as morphological features. Having this knowledge on hand gives increased confidence to those of us starting out on our adventures in orchid identification.

Heidi Zimmer

Editor's note: Heidi Zimmer is a past editor of APC and is currently employed as an orchid researcher at the Centre for Australian National Biodiversity Research (a joint venture between CSIRO and Parks Australia), based at Australian National Herbarium in Canberra.

ANPC news and conferences

Safe custody for Native Guava – Project Update

Our collaborative project to secure safe custody for the Critically Endangered Native Guava (*Rhodomyrtus psidioides*) is underway. Project partners at Lismore Rainforest Botanic Garden, the Australian Botanic Garden Mount Annan, the Blue Mountains Botanic Garden Mount Tomah, the Australian National Botanic Garden and Dandenong Ranges Botanic Garden received their first plants last spring. At each location, these plants have been established in the ground and monitored carefully for growth, fruiting and any signs of Myrtle Rust infection. Propagation has begun at the Australian Botanic Garden Mount Annan for the next round of plants to be distributed later in the project, as a joint project of the Science and Horticulture teams. *Ex situ* conservation is needed to ensure this species will survive while long-term recovery options are pursued.

Did you know that the Native Guava (*Rhodomyrtus psidioides*) plants in our current project have been studied by the ReCER team (<https://recer.org.au/>) to understand their genetic diversity? This allows us to check whether the *ex situ* populations adequately capture the diversity present in the wild populations – and the good news is that they do! The same process is underway for germplasm sampled in QLD populations. Using genetic information also helps us send each partner garden a set of plants that is unrelated and genetically diverse, so these precious plants have a good chance of producing seeds, which can be collected for future research or management activities.

This project is supported by funding from the Australian Government.

<https://www.anpc.asn.au/safe-custody-for-native-guava/>

Membership fee increase

You may have noticed the ANPC has been moving our forums online and holding hybrid events over the last few years. We've enjoyed making our events more accessible and based on member feedback, you have too. As we move out of the pandemic, we need to remain flexible. The ANPC understands the way we connect has changed. To continue bringing you high quality events and keep pace with inflation, we'll be raising our membership prices.

From 1 October 2022 our membership prices increased. This is the first increase in ANPC membership fees in 6 years (our last change was an 8% increase in 2017). The new prices are available on our webpage.

<https://www.anpc.asn.au/membership/>

Healthy Seeds endorsed

Our Healthy Seeds Roadmap has been endorsed by the NSW Environmental Trust. The Roadmap summarises the findings of our Healthy Seeds project and plots a course for the future of the native seed sector in NSW. It recommends how to overcome barriers and forms an action plan of interventions including restoration planning, licencing and training. The native seed sector is the backbone of restoration efforts – it's hard to grow plants without seed! To read the Roadmap please visit our project webpage.

<https://www.anpc.asn.au/healthy-seeds/>

Epiphytic orchid surveys

Thanks to funding from the San Diego Zoo Wildlife Alliance (SDZWA) Plant Conservation Team, the ANPC started surveying epiphytic orchids in north-eastern NSW in September. The Black Summer fires are thought to have hit many of these species (which occur on rocks and/or trees) particularly hard. This is because they are killed by intense fire due to lack of both an underground dormant phase and a persistent seedbank from which to recover.

The surveys will document the impact of the fires, establish the geographic distribution and size of the remaining populations, and inform conservation assessment and threatened species listings. Eleven species have been selected, with the focus so far on *Plectorrhiza purpurata*, *Sarcochilus aequalis* and *Tropilis angusta* (syn. *Dendrobium angustum*). Although the North Coast and Northern Tablelands target areas are amazingly green following the last few years of abundant rain, the legacy of the Black Summer fires remains. A recently found population of *Plectorrhiza purpurata* was determined to be heavily impacted, with most host plants dead and all epiphytes on those plants killed.

<https://www.anpc.asn.au/prevent-rare-plant-extinction-and-reduce-impacts-of-future-fires/>



Plectorrhiza purpurata growing in Cottan-Bimbang National Park.
Photo: Lachlan Copeland

BGCI/BGANZ Congress

The 7th Global Botanic Gardens Congress was held in Melbourne in September. The ANPC's Amelia Martyn Yenson presented a talk in the symposium titled 'Germplasm Conservation in Australia – a network of expertise for a biodiverse flora'. Amelia also received the 2022 Marsh Award for International Plant Conservation in recognition of her work managing the revision of the Germplasm Guidelines! The Marsh Award recognises an individual in the early to mid-stages of their career who has made a significant achievement in the conservation of rare and endangered plant species and plant diversity. Congratulations to Amelia from all of us at the ANPC, it's very much deserved!

The Congress had 500 delegates attend from 36 countries. You can read a summary of the main action points here: <https://www.bgci.org/wp/wp-content/uploads/2022/10/7GBGC-Final-Conclusions-2.pdf>

New Corporate Members

We would like to welcome three new Corporate Members who have recently joined the ANPC and thank them for their support:

- Austspray Environmental Weed Control Pty Ltd
- Umwelt Environmental and Social Consultants
- Queensland Department of Environment and Science, Threatened Species Operations

ASBP annual report released

The Australian Seed Bank Partnership have just released their 2021-22 Annual Report. To see the incredible work the Partnership have accomplished over the last year head to their website.

<https://www.seedpartnership.org.au/about-us/strategies-and-reports/>



(Left) Amelia receiving the Marsh award; (right top to bottom): Dr Karen Sommerville, Jenny Guerin and James Wood presenting in the Germplasm Symposium. Photos: Brad Desmond

Seed science in Spain

DR LYDIA GUJA AND DR GEMMA HOYLE

In September, two of the Australian National Botanic Garden's (ANBG) National Seed Bank team shared their work at the International Society for Seed Science: Seed Ecology Conference VII held in Spain. Dr Lydia Guja (Manager of the National Seed Bank and ANPC Committee member) and Dr Gemma Hoyle (Seed Scientist) made several contributions, chairing sessions, delivering two oral presentations, sharing two posters and co-authoring a further three presentations.

Presentations

Lydia presented research undertaken by ANBG and The University of New South Wales to understand the environmental and genetic controls of seed germination in the genus *Pomaderris*, including many rare species of conservation concern. Published in *Frontiers in Plant Science*, the study is available to read here: <https://www.frontiersin.org/articles/10.3389/fpls.2021.779651/full>

Gemma presented research carried out in collaboration with The Australian PlantBank, Australian Tropical Herbarium and James Cook University. Gemma's research investigated the importance of light/dark and light quality on germination of Australia's tropical mountain cloud forest species. Gemma is aiming to publish this study in a special edition of *Australian Journal of Botany* on 'Australasian Seed Science' in 2023.

Gemma and Lydia also presented posters that promoted the Australian Network for Plant Conservation's (ANPC) Guidelines for the Translocation of Threatened Plants in Australia, restoration use of seeds (Florabank Guidelines), and Plant Germplasm Conservation in Australia (produced with the Australian Seed Bank Partnership). Discussions during the poster sessions highlighted the strong seed banking and research partnerships across Australia that have enabled the production of such resources, and many conference participants commented that these publications will be invaluable to their work.

Key learnings

The conference culminated in a chance to socialise and reflect upon the many take-away learnings from the meeting:

- Thanks to COVID-19 and lockdowns, 2020-21 was 'the year of the meta-analysis'; pooling data already collected to examine ecological correlates of seed traits.

- A rise in macroecology studies aiming to understand seed function at global scales.
- Increasing application of seed ecology for successful threatened species conservation and landscape restoration.
- Long-term studies are now becoming possible following 20+ years of seed bank storage.
- Resurrection of extinct species becoming increasingly possible thanks to well-managed herbarium specimens that fortuitously contain seeds, and seed bank collections.
- International interest in post-fire seed ecology with the rise of bushfires across the world including Europe.
- Micro-climate data and how this is critical to understanding and investigating seed ecology.
- How the diversity among seeds will help to buffer the effects of climate change.
- The global deficit of tropical seed trait data.

The conference also highlighted the urgent need to share data in international seed and germination trait databases to maximize data use and facilitate new research. This resulted in the launch of a new international database for primary seed germination data and an open call for contributions (<https://www.unioviiedo.es/seedarc>)



(Left) Dr Gemma Hoyle presenting a poster on the recently revised Plant Germplasm Conservation in Australia (produced with the Australian Seed Bank Partnership).
(Right) Dr Lydia Guja presenting a poster on the recent publications revised by the ANPC.

Invitation to share your seed germination data

We'd like to introduce SeedArc v1.0: A global archive of primary seed germination data.

Seed germination is a key stage in a plant's life. Information on seed germination responses to abiotic cues is still underrepresented in many plant lineages, biogeographic regions and habitats, despite its high relevance for basic and applied plant science. When available, much information is scattered and disaggregated into a multitude of sources. The current research community widely acknowledges the need for a large-scale open-science infrastructure to archive and share seed data supporting macro eco-evolutionary analyses. SeedArc has been created to close this gap and further stimulate seed research.

SeedArc is coordinated by a partnership of seed scientists dedicated to:

- share primary data from seed germination experiments;

- collaborate in its analyses;
- build a seed germination database available to the research community; and
- advance open science in seed ecology.

SeedArc are inviting you to contribute data on seed germination from all over the world, regardless the type of experiment conducted and number of tested species. The focus of the first call lies on primary data collected in lab experimental studies. They offer fair data ownership and co-authorship rules. By contributing to SeedArc you will ensure that your data is preserved and reused. You will also be able to participate in international research collaborations on seed germination ecology.

Visit the website to submit your data and feel free to discuss with the Australian representative on the coordination team Dr Lydia Guja.

<https://www.unioviedo.es/seedarc>

Plant Cuttings

Editor's note: News excerpts are clipped from a diversity of sources. To read the articles in full follow the links attached to each clipping. The views expressed in these articles are those of their authors and do not necessarily represent the opinion of the ANPC.

Sexual deception: orchid tricks and traps gnat in pollen den – Australian Geographic, 3 August 2022

A new study has described how a sexually deceptive orchid, *Pterostylis cycnocephala*, exploits the sexual preferences of their male pollinators to achieve pollen transfer. This orchid attracts its pollinator, the male gnat, *Bradyisia* (Diptera: Sciaridae), with the 'perfume' of a female gnat and a black appendage that looks like a female gnat. The male then courts the apparent female with wing fanning and abdomen curling, before clasping the flower with its genitalia and rotating 180° as they attempt to assume their regular mating position. This movement triggers a 'booby trap' where the plant snaps shut, and he must climb out becoming covered in pollen in the process, says one of the study's researchers, PhD candidate Tobias Hayashi.

<https://www.australiangeographic.com.au/news/2022/08/sexual-deception-orchid-tricks-and-traps-gnat-in-pollen-den/>

The race to save fungus-threatened plants from extinction – ABC, 31 August 2022

Sydney's on track for its wettest year ever, and now botanists are scrambling to save entire plant species

that are under the threat of extinction from diseases that thrive in the rain. A fungus of dire concern has already spread well beyond the east coast, so scientists have turned their efforts to developing seedlings of plants that will be able to fight off the threat.

https://www.abc.net.au/radio/programs/pm/race-to-save-plants-from-extinction-threat/101392954?utm_campaign=abc_radio_pm&utm_content=link&utm_medium=content_shared&utm_source=abc_radio_pm

NSW Auditor-General issues stern criticism of state's biodiversity offset scheme – ABC, 1 September 2022

The New South Wales Auditor-General has found the government has failed to deliver an effective biodiversity offset scheme because its policy had no strategy or safeguards. Under the Biodiversity Conservation Act 2016, the scheme enables landholders to establish in-perpetuity Biodiversity Stewardship Agreements on sites to generate credits for the unique biodiversity on that land.

<https://www.abc.net.au/news/rural/2022-09-01/nsw-biodiversity-offset-schemes-criticised-by-auditor-general/101391042>

Western NSW landholders call for more resources to fight Hudson pear spread – ABC, 5 September 2022

Farmers and residents in Lightning Ridge are calling for more support to control a growing infestation of a state-declared noxious weed in north-west New South Wales. Hudson pear is a highly invasive cactus that was brought to Australia sometime in the 1960s.

https://www.abc.net.au/news/2022-09-05/hudson-pear-biosecurity-invasive-north-west-nsw/101395948?utm_campaign=abc_news_web&utm_content=mail&utm_medium=content_shared&utm_source=abc_news_web

Ten days to plant 6000 native orchids? Easy for army of volunteers – The Sydney Morning Herald, 11 September 2022

Spending 10 days on your hands and knees in regional NSW planting more than 6000 native orchids isn't for everyone. But for more than 40 volunteers, listening to the birds singing and swapping a few jokes helped during the long hours of trying to save the plant species from going extinct.

<https://www.smh.com.au/environment/conservation/ten-days-to-plant-6000-native-orchids-easy-for-army-of-volunteers-20220908-p5bgc4.html>

Native seed garden a lifeline for Kangaroo Island's endangered flora – ABC, 18 September 2022

In the summer of 2019–20, Kangaroo Island recorded its most devastating bushfires on record. The island, located off the mainland of South Australia, is home to nearly 900 native plant varieties and is an ecological haven due to its isolated, unspoilt natural environment.

<https://www.abc.net.au/news/rural/2022-09-18/kangaroo-island-seed-garden-saving-endangered-flora/101448952>

Invasive soil-borne disease made worse by wet weather, threatens bunya pines – ABC, 21 September 2022

Hundreds of ancient bunya pines in a Southern Queensland National Park are facing a growing threat as wet weather heightens the spread of an invasive soil-borne disease. The recent rain and upcoming third La Niña summer present the perfect conditions for phytophthora to spread which has researchers, park rangers and traditional owners of the Bunya Mountains National Park worried.

https://www.abc.net.au/news/2022-09-21/wet-conditions-make-worse-a-serious-threat-killing-bunya-trees/101460316?utm_campaign=abc_news_web&utm_content=mail&utm_medium=content_shared&utm_source=abc_news_web

The lillipilly forms the world's largest genus of trees – and should be an Australian icon – The Mandarin, 30 September 2022

You're probably familiar with the sight of a lillipilly bush. This hardy Australian staple – a glossy evergreen bearing powder-puff flowers and clusters of bright berries – features in many a garden hedge. Our research helped reconstruct the evolutionary history of lillipillies in unprecedented detail. We show how lillipillies evolved in Australia and now form the largest genus of trees in the world. <https://www.themandarin.com.au/201354-the-lillipilly-forms-the-worlds-largest-genus-of-trees-and-should-be-an-australian-icon/>

Slave traders' names are still stamped on native plants. It's time to 'decolonise' Australia's public gardens – opinion piece for The Guardian by Brett Summerell, 1 October 2022

For too long we've dismissed Indigenous knowledge of the natural world. At Sydney's botanic garden, signage is starting to reflect Aboriginal names.

https://www.theguardian.com/commentisfree/2022/oct/01/slave-traders-names-are-still-stamped-on-native-plants-its-time-to-decolonise-australias-public-gardens?CMP=Share_iOSApp_Other

The plant destroyer – ABC Radio, 5 October 2022

Learn more about the microbes that love eating through some of our most important food sources.

Prof Brett Summerell, Chief Scientist at the Australian Institute of Botanical Science, Royal Botanic Gardens and Domain Trust chats to Richard Glover for Self Improvement Wednesday.

https://www.abc.net.au/sydney/programs/drive/siw-plant-destroyer/101505638?utm_campaign=abc_radio_sydney&utm_content=twitter&utm_medium=content_shared&utm_source=abc_radio_sydney

Researchers put radio backpacks on bumblebees in Tasmania in insect-tracking trial – ABC, 10 October 2022

Researchers are attaching radio transmitters to bumblebee queens in Tasmania's far south to learn how they could be interacting with native species, and to test the limits of insect-tracking technology.

<https://www.abc.net.au/news/2022-10-10/bumblebees-radio-transmitters-research-insect-tracking/101515280>

Rare native plant discovered on Hay travelling stock reserve – NSW Government 11 October 2022

A population of rare native yam daisies has been discovered on a travelling stock reserve (TSR) near Hay, with work underway from Riverina Local Land Services to protect the native plant. The discovery was made on a TSR north of Hay by Booligal Primary School Principal, Lindy Stewart who is an avid naturalist and photographer.

<https://www.lls.nsw.gov.au/regions/riverina/latest-news-and-newsletters/r-news/2022/rare-native-plant-discovered-on-hay-travelling-stock-reserve>

Orchid hunting has come a long way. In 5 steps you can join a national research effort – Heidi Zimmer (CSIRO)

Orchid hunting conjures images from the 1800s – explorers in mud-spattered khaki, traipsing through impenetrable jungle, overloaded with equipment: jars, bottles, bags and boxes, a gun (to shoot down tree-top orchids) and a magnifying glass. Things have changed a bit since then. You don't need to sail halfway around the world – and all you need is a camera or smartphone.

<https://blog.csiro.au/orchid-hunting-citizen-science/>

Winner of inaugural Peter Fairweather Award announced – ESA Website

The Ecological Society of Australia is pleased to announce that Ms Renske Jongen has been awarded the inaugural Peter Fairweather Student Conference Support Award. Renske is a PhD candidate at the University of Sydney, investigating the relationship between seagrass and sediment to aid restoration efforts in the face of climate change.

<https://www.ecolsoc.org.au/news/winner-of-inaugural-peter-fairweather-award-announced/>

From small acorns, Botanic Gardens looks to climate-proof its future – The Age, 27 September 2022

The gardens launched a Climate Assessment Tool that will allow botanic gardens around the world to punch in their location and work out which of the globe's more than 60,000 tree species will tolerate its end-of-century climate.

<https://www.theage.com.au/national/victoria/from-small-acorns-botanic-gardens-looks-to-climate-proof-its-future-20220922-p5bk47.html>

Events and opportunities

Webinar recording – Aliens Among Us

A recording of the invasive Species Council's webinar of 19 September, 'Aliens Among Us', is now on line at www.invasives.org.au/resources/aliens-among-us-the-q-a-sessions/ The webinar focuses on the threat from invasive species as highlighted in the 2021 *State of the Environment Report* released a few weeks ago. Panel members include Dr Barry Hunter, a co-author of the report's Land chapter, Tim Low a writer and biologist and Richard Swain, an Invasive Species Council Indigenous Ambassador.

Save the date – 2023

The International Conservation Translocation Conference is being held in Fremantle, Western Australia next year from 13-15 November 2023. For more information, visit <https://conservationtranslocations.com/>

Free online training – Nursery pests and diseases Two new online courses (hitchhiker pests and nursery pests and diseases) have been developed by Biosecurity Queensland, Plant Health Australia, and the NSW Government. These free 30 minute eLearning courses aim to help people identify and take action on exotic pests relevant to their industry.

<https://www.greenlifeindustry.com.au/online-training-supports-good-jobs-in-face-of-hitchhiker-pests>

Save the date – 2023 13th Biennial Bushfire Conference

The Nature Conservation Council of Australia has announced the 13th Biennial Bushfire Conference will be held from Wed 24 to Fri 26 May 2023. This will be a live event (with some hybrid capacity) held in Sydney at the Teachers Federation Conference Centre. More information coming soon.

https://www.nature.org.au/bushfire_conference_2023

Virtual Issue – publishing science 101

CSIRO Publishing have put together a virtual issue with advice on submitting and promoting your research paper. Editor-in-chief of Pacific Conservation Biology, Mike Calver has put together overviews for new authors that demystify the journey from writing to proofs.

<https://www.publish.csiro.au/pc/virtualissue/3182>

ANPC Corporate Members

ANPC gratefully acknowledges the support of the following corporate members:

Albury Botanic Gardens, NSW

Australian National Botanic Gardens, ACT

Austspray Environmental Weed Control Pty Ltd, QLD

Ballarat Botanical Gardens, VIC

Botanic Gardens of Adelaide, SA

Centre for Australian National Biodiversity Research, ACT

**Department of Biodiversity, Conservation
and Attractions, WA**

**Department of Planning, Industry and
Environment, Saving Our Species, NSW**

**Environment, Planning and Sustainable
Development Directorate, ACT**

Naturelinks, VIC

Department of Environment and Science, QLD

Royal Botanic Gardens and Domain Trust, NSW

Royal Botanic Gardens Victoria, VIC

Royal Tasmanian Botanical Gardens, TAS

Umwelt (Australia) Pty Limited, NSW, ACT, WA, QLD, VIC

Wingecarribee Shire Council



AlburyCity



**Australian National
Botanic Gardens**



**Botanic Gardens of
SOUTH AUSTRALIA**



NATURELINKS



**Royal
Botanic
Gardens
Victoria**



**ACT
Government**



**CENTRE FOR
AUSTRALIAN
NATIONAL
BIODIVERSITY
RESEARCH**



**Department of Biodiversity,
Conservation and Attractions**



**AUSTRALIAN
INSTITUTE OF
BOTANICAL
SCIENCE**



**Queensland
Government**



Proudly sponsored by
Saving our Species



**Wingecarribee
SHIRE COUNCIL**



**Royal Tasmanian
Botanical Gardens**



Dead Native Guava trees at
Bongil Bongil National Park,
NSW, only 2 years after the
arrival of Myrtle Rust.
Credit Peter Entwistle

ANPC Donation Drive

Will you help us in the fight against Myrtle Rust?

We are raising funds for our work on Myrtle Rust

Hundreds of plants species in the family Myrtaceae, including our bottlebrushes and paperbarks are vulnerable to infection by Myrtle Rust. This invasive fungal disease has caused five native plant species to jump straight to the 'Critically Endangered' category since it was introduced to Australia in 2010.

A further 20 to 30 Australian native species are known, or suspected, to be in decline. Over 300 more are susceptible to a lesser degree. This number will rise.

We need to take our fight against Myrtle Rust to the next level.

The Australian Network for Plant Conservation is raising funds to:

- **Further develop the Myrtle Rust information hub** on our website to provide even more up-to-date, scientifically accurate information and images of the disease and the species affected by it.
- Continue to **identify relevant global research and information** and bring this to the heart of decision making about Myrtle Rust in Australia.
- **Share our evidence-based resources** with the wider conservation community.
- Continue to **work across the silos that divide** the people and resources needed for an integrated national response to the disease.
- **Promote the National Action Plan for Myrtle Rust**, and lobby for the new resources that will be needed by botanic gardens and agencies to implement it.
- **Promote improved environmental biosecurity measures** for this and future environmental plant diseases.

Our Myrtle Rust team are happy to discuss our work with prospective donors.
Please contact us at mytlerust@anpc.asn.au

PLEASE DONATE NOW:

<https://www.anpc.asn.au/myrtle-rust/donationform/>